

T S
1614

.M8

LIBRARY OF CONGRESS.

Class. TS 1614

Shelf .M8

PRESENTED BY

UNITED STATES OF AMERICA.

THE officers of the "National Association of Wool Manufacturers" having procured, at the expense of the Association, extra copies of the within Report, prepared and published under the direction of the Department of State, take pleasure in placing in the hands of the members of the Association, and of others interested in the production and manipulation of Wool, an important contribution to the history of the Wool industry of the United States and Europe.

PARIS UNIVERSAL EXPOSITION, 1867.
REPORTS OF THE UNITED STATES COMMISSIONERS.

R E P O R T

UPON

WOOL AND MANUFACTURES OF WOOL,

BY

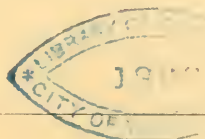
E. R. M U D G E,

UNITED STATES COMMISSIONER,

ASSISTED BY

J O H N L. H A Y E S,

SECRETARY OF THE "NATIONAL ASSOCIATION OF WOOL MANUFACTURERS"



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1868.

TS 1614
M2

5-33131

CONTENTS.

SECTION I.

WOOL AND ITS CULTURE.

Varieties of wool in European markets—Necessity of protection to American wools—Clothing wools—Silesian and Prussian clothing wools—Culture of fine clothing wools in the United States desirable—American clothing wools—Vermont sheep in demand in Australia—Merino combing wools—Sheep husbandry in France—English combing wool—Cheviot sheep—Problems to be resolved in American sheep husbandry—Vast scale of sheep husbandry in Russia—Exemption of duties on sheep imported for breeding.—pp. 6-17.

SECTION II.

WOOLLEN MANUFACTURES—COMPARISON OF EUROPEAN AND AMERICAN MANUFACTURES.

Antiquity of fabrication in Europe—Characters of woolly fibre—Consumption of the world—Characteristic fabrics of eastern nations—England—Belgium—Prussia—Austria—Russia—Relative rank of nations in production of woollen fabrics—Awards to leading centres of European production—Characteristics of American fabrics—Marked excellence in card-wool fabrics—Fancy cassimeres, shawls, flannels, cloakings—American carpets—Evidences of progress within five years—Awards of medals to American manufacturers—Award of grand prize to Pacific mills—Statements of the management of those mills—Principles upon which New England mills were founded—Mr. Nathan Appleton's statement—Relative cost of production in the United States and Europe—Equality in skill, machines, and efficiency of labor—Disadvantages of cost of capital and labor—Necessity of protective duties to neutralize European advantages—Relations of American sheep husbandry to American manufactures.—pp. 17-32.

THE WOOLLEN INDUSTRY OF EUROPE.

French woollen fabrics at the Exposition—Distribution of groups of manufacturing establishments in France—General features of French industry—Contributions of French inventions and fabrics to the woollen industry—Culture of taste in France—Schools of design at Lyons—Progress of the art of dyeing in France—Colbert's regulations—Discovery of steam colors—Discovery of artificial ultra-marine—Improvements in madder dyes—French purple—Discovery of murexide—The aniline colors.—pp. 32-44.

CHARACTERISTIC CENTRES IN FRANCE.

ELBEUF.—The great centre of the fancy cassimere manufacture—Designers—Echantilleurs—Facilities for credit—Separate establishments devoted to single processes of manufacture—Wages and condition of industrial population.—pp. 45-49.

SEDAN.—The centre of fine cloth manufacture—Invention of fancy cassimeres—Suppression of drunkenness—Wages and condition of industrial population.—pp. 49, 50.

REGION DU MIDI.—Centre of manufacture of fabrics for common consumption—Production of peculiar fabrics for the Levant—For the army—Workshop nurseries—Singular features of military establishment of Villeneuve—Wages and condition of workmen.—pp. 50-53.

RHEIMS.—A centre of combing wool industry—Fabrication of merinos—Improvements in combing wool—Power-loom weaving applied to merinoes—Dependence upon the United

- States—Advantages of undertaking the merino manufacture in the United States—Wages and condition of workmen.—pp. 53-55.
- CATEAU.—Immense establishment—Perfection of machinery and processes—Wages and condition of workmen.—pp. 55-57.
- ROUBAIX.—The rival of Bradford—History of its growth—Public sentiment opposed to the Anglo-French treaty—Faithfulness of fabrication—The profitableness of manufacturing light fabrics for female consumption—Wages and condition of industrial population.—pp. 57-60.

OTHER EUROPEAN NATIONS.

- BELGIUM, GERMANY, AND AUSTRIA.—Productions, and rates of wages.—pp. 60, 61.
- GREAT BRITAIN.—Growth of the cities of the West Riding—Bradford, Leeds, Huddersfield, Halifax—Statements of value of British woollen manufacture in 1861—Wages and condition of workmen—Decline of arts in England—Cause of decline; Production to supply the markets of the world—Duties of American manufacturers.—pp. 62-66.

APPENDICES.

	Page.
A. AMERICAN MERINOS.—Prepared by request for the report, by Hon. HENRY S. RANDALL, LL.D., president of National Wool Growers' Association.....	67
B. THE ANGORA GOAT: ITS ORIGIN, CULTURE, AND PRODUCTS, by JOHN L. HAYES, secretary of the National Association of Wool Manufacturers.....	81
C. THE WOOL BEST ADAPTED TO VARIOUS MANUFACTURES.....	107
D. COMBING WOOL IN THE UNITED STATES. Letter of Mr. JOSEPH WALWORTH.	118
E. WOOLLEN MANUFACTURES IN THE UNITED STATES.....	122
F. THE WOOLLEN AND WORSTED TRADE OF GREAT BRITAIN.....	131

WOOL AND MANUFACTURES OF WOOL.

INTRODUCTION.

The preparation of a report upon wool and manufactures of wool having been committed to the undersigned, it was his original purpose to limit himself to giving the general impressions made at the Universal Exposition of 1867 upon a business man greatly interested in, rather than technically informed as to, the woollen manufacture and the raw material supplying it. But in conformity with the views of the Department of State, that a report relating to so important a branch of national industry might take a wider scope with advantage to the public interests, the undersigned has consented to modify his original purpose, by adding to his personal observations more general views as to the present condition of the woollen industry at home and abroad, and such statistical statements, obtained from the most recent and authoritative sources, as would throw light upon its economic and social relations. In the preparation of this work he has been assisted by Mr. John L. Hayes, secretary of the National Association of Wool Manufacturers, to whom the literary execution of the report has been intrusted.

SECTION I.

WOOL AND ITS CULTURE.

VARIETIES OF WOOL IN EUROPEAN MARKETS—NECESSITY OF PROTECTION TO AMERICAN WOOLS—CLOTHING WOOLS—SILESIAN AND PRUSSIAN CLOTHING WOOLS—CULTURE OF FINE CLOTHING WOOLS IN THE UNITED STATES DESIRABLE—AMERICAN CLOTHING WOOLS—VERMONT SHEEP DEMANDED IN AUSTRALIA—MERINO COMBING WOOLS—SHEEP HUSBANDRY IN FRANCE.—ENGLISH COMBING WOOL—CHEVIOT SHEEP—PROBLEMS TO BE RESOLVED IN AMERICAN SHEEP HUSBANDRY—VAST SCALE OF SHEEP HUSBANDRY IN RUSSIA—EXEMPTION OF DUTIES ON SHEEP IMPORTED FOR BREEDING.

To commence with the raw material, the first impression made upon an American manufacturer by an observation of the woollen manufactures of Europe, as displayed at the Exposition, is the immeasurable advantage which the woollen manufacturer of Europe has in the command of an unlimited supply of wool, and other raw material of every variety, free of duty. The policy of the modern governments of Europe, unrestrained by any regard for the opinions or prejudices of agriculturists so controlling here, is first and foremost to develop the manufactures of their several countries. Freedom from duties on raw material and breadstuffs is but one mode of protection. The necessity for duties on wool as a measure of encouragement to the wool-grower has passed away. Sheep husbandry in Europe could not be extended by protective duties, as all the land that could be profitably devoted to this purpose is already occupied. England has one sheep to one and three-quarters of an acre of land, while Ohio and Vermont have one to four and a half acres, New York one to six and a half acres, Iowa one to twenty-four acres, and the whole United States one to fifty-seven acres. The perfection to which the leading varieties of European wools has attained removes them from all competition, and renders protective duties unnecessary. No lustrous combing wools can compete with the Lincoln, Leicester, and Cotswold wools of England; no clothing wools with the Saxon and Silesian wools of Germany; no soft combing wools with those of the Rambouillet stock of France. The culture of the latter wools was developed by protection until their excellence relieved them from competition, and even the agriculturists of France assented to the abolition of the duty on wool. The great centre of distribution for the great part of the wool of the world, not consumed at home, is England, the distribution being favored by her warehousing system. All the wool manufacturers of Europe are gathered at the annual sales at London. The European supply of raw material constitutes but an inconsiderable portion of the consumption of Europe. The importations have increased with marvellous rapidity.

The importations of wool into England a little over 30 years ago, viz.

in 1830, were, in round numbers, from Germany, 74,000 bales; from Spain and Portugal, 10,000 bales; the British colonies, 8,000 bales; sundry other places, 5,000 bales; total, 98,000 bales; and yet at that period, as appears from the testimony before the House of Lords, in 1828, every warehouse in England was filled with wool, and stocks were lying on hand for five or six years. In 1864 there were imported, from Australia, 302,000 bales; from the Cape of Good Hope, 68,000 bales; from South America, 99,000 bales; and 219,336 bales from other sources—in all, 688,336 bales. Australia now supplies more than three times the whole amount of foreign wool consumed in England a third of a century ago, and the production of South America exceeds the whole consumption then. The advantages which the European manufacturer enjoys over the American in the command of an unlimited supply of every variety of wool cannot be over-estimated. The range of fabrication of the American manufacturer in clothing and combing wools is limited to the produce of American flocks, under the almost prohibitory duty upon those wools. The European can select from the peculiar products of every climate and soil of the whole world, which are poured into the great centres of distribution at London and Liverpool. Hence the infinite variety of European manufactures so conspicuous at the Exposition, and hence the capacity of the European manufacturer to relieve himself from home competition by changing at pleasure the character of his fabrics. It is true that the American is able to contend with the European manufacturer, who has his wool free of duty, by receiving the imposition of a specific duty on foreign cloths just sufficient to reimburse the duties on wool. Without this neutralizing duty the American could not live for a day, and with it he still suffers in the limitation of his supply of raw material.

By these observations upon the present comparative advantages of the American and foreign manufacturer in the supply of raw material, it is not to be inferred that the undersigned would advocate the application to this country of the British system of protection by the free admission of raw materials which can be advantageously produced here, or that he would for a moment maintain that the wool-grower can obtain sufficient encouragement through the protection of the manufacturer. The higher demands of American civilization require that all our industries should be defended against the cheap capital and labor of competing nations. The labor which produces the wool cannot be distinguished from that which spins and weaves it. Considerations of national independence require us to seek to the utmost possible extent all our supplies from domestic sources. The woollen manufacturer has the best assurance of permanent prosperity when he can look to an uninterrupted supply of wool from sources not liable to be cut off by war, famine, pestilence, or political revolutions abroad. The American wool manufacturer, no less than the wool-grower, has the only market for his fabrics at home, and can have a profitable market only when all the industry of the country is profitably occupied. The system of political economy essential to

industrial prosperity in this country demands that the claims of the wool-grower and manufacturer should be equally respected. If any views here presented should be regarded as suggestive of a change of the system of duties now prevailing, they should be regarded as addressed to American wool-growers alone, with the distinct acknowledgment that it is their right, after intelligent consultation with the representatives of kindred industries, to demand the duties which they shall judge to be necessary for the protection of their own.

CLOTHING WOOLS.

To return to the wools displayed in the great warehouses of Europe, and exhibited at the Exposition. The American manufacturer is struck by the variety of wools, not produced abundantly here, and first with the Silesian and Saxony clothing wools of Germany, the fleeces small and the fibre exceedingly fine, and marked by the distinctness and number of its curves or wrinkles; the staple very short, the wools distinguished for their felting qualities, both the fineness and shortness of staple being essential qualities for the fine broadcloths and doeskins, for which the German manufacturers are so distinguished. These wools have the highest price of any grown. The wools of Prussia of this character were very remarkable, and among them those exhibited by Mr. Dopping, of Silesia, are worthy of especial mention for their shortness and the distinctness of the curves, which were so sharply defined as to give the impression that they had been artificially crimped. Next to these, and scarcely inferior, are some of the Australian wools, which were distinguished for the same qualities of fineness of fibre and shortness of staple, and equally observable for their admirable condition, evincing the care with which they are washed and put up. These wools were exhibited in such quantities as to give one the impression of passing through the warehouses of London. Next in quality are the Cape wools. Last among the fine clothing wools in quality and price are those of Buenos Ayres. The German and Australian wools exhibit the highest existing type of the product of the merino race. In their culture weight of fleece is never sought for. The efforts of the grower are devoted solely to producing fineness of fibre and shortness of staple. Without the command of wool of this character for filling it is hopeless to attempt the manufacture of the best face goods, such as broadcloths and doeskins. Our foreign importation of German cloths is mainly confined to the black broadcloths, cassimeres, and doeskins made from these wools. There is no difficulty in commanding the skill required for this manufacture, as is evinced by the goods exhibited by Mr. Slater, of Rhode Island. All the difficulties of manufacture can be surmounted by the importation of German workmen. Several hundred sets of machinery could be occupied here in the manufacture of these goods, demanded for home consumption. The warps, which could be made of such American fleece as is now grown here, would take up two-fifths of the wool required for this manufacture. This

would be so much added to the demand for this character of wool. The relief afforded to the manufacturer, by being able to vary his fabrics, would diminish the competition among those compelled to manufacture only one style of goods, and, giving more profits to the manipulator of the wool, would secure better prices to the wool-grower. The great problem to be solved in the clothing-wool industry in this country is how these wools shall be secured. The wool-growers assert that they can be grown in this country, and this is by all means the most desirable source from which they could be obtained. The success in certain districts in Tennessee, Pennsylvania, and Virginia, in former times, is an assurance that they can be grown. The present supply is altogether insufficient for any progress in the fine cloth manufacture. It is gratifying to learn that importations are being made of the best Silesian stock. It is the duty of the manufacturer to encourage these efforts by discriminating in his prices for the finest wools. The growth of these wools is not a question of soil or climate, but of profit. If these desired wools are more remunerating than others, they are certain to be produced. But the solution of the problem whether we shall manufacture fine broad-cloths in this country depends mainly upon the wool-growers. It is for them to decide whether or not these wools shall be grown here; if not, whether they shall be admitted at a moderate duty. If the product of the finest woolled sheep is too small to admit of profit in their culture, the only objection to their growth here, it is worthy of serious consideration by the great body of American wool-growers whether their own interests, by the greater consumption of wool, which can be profitably grown by mixture with foreign fine wools, would not be secured by admitting, at a moderate duty, the highest priced German and Australian wools, not including such as the mestiza, which compete with the wools grown here. Any movement for the development of this important branch of manufacture, whether by the growth of the desirable wools, their admission at a lower rate of duty, or by a higher specific duty upon extra fine wool cloths, must emanate from the wool-growers, for it is better that the manufacture of the highest clothing wools should be abandoned than that the harmonious arrangements between the agricultural and manufacturing branches of the woollen interest, so essential to its stability, should be disturbed.

AMERICAN CLOTHING WOOLS.

It should be clearly understood that the wools above referred to are desirable as an addition to, and not as a substitution for, the great bulk of the present American fleeces. The annual production of wool in the United States was estimated, in 1866, at 95,000,000 pounds; and it is estimated that this constitutes about 70 per cent. of the wool manufactured in this country—this wool being the product of 30,000,000 sheep, consuming 30,000,000 bushels of corn. Our domestic fleece is, therefore, the chief source of our supply. This wool is mainly of a

medium quality, and is produced from grades of the merino race. With the increasing growth of the country the demand for this wool should proportionally increase. Its great value for the purposes for which it is generally used is shown in the excellence of our peculiar American fabrics, to be hereafter referred to. There is reason to believe that the yield of scoured wool, of a medium character, from sheep of the race now recognized as the American merino,¹ which has originated in Vermont, is greater than has been obtained from sheep of the merino blood in any country except those of France. Manufacturers are apt to complain of the greasy character of this wool—a complaint too well founded with respect to wool produced from show sheep; sufficient development of yolk is, however, essential to the greatest yield in wool. It is for the interest of the manufacturer and of the country that the system of culture should be pursued by the wool-grower which shall produce the greatest amount of clean wool with the greatest economy to the wool-grower. The wool-growers, through their associations, which are now being extensively formed and conducted with an intelligence displayed in no other department of agriculture, will determine how far this production of yolk can be carried with ultimate profit, and whether the evil of excessive yolk, if it is one, may not be corrected by the infusion of blood of another stock. A very interesting and instructive fact in favor of the American merino has been stated, while this paper was being prepared, by Mr. Bowes, the eminent wool dealer of Liverpool, viz: "That Vermont bucks are now being selected to give body and quality to the degenerated wools of New Zealand."

MERINO COMBING WOOLS.

Conspicuous among the wools displayed at the Exposition were those of the merino race, distinguished for the softness and length of fibre. Those from France and Australia were the most noticeable. The wools of this kind from Australia having been derived from the French stock, the length of fibre, enabling these wools to be combed, adapts them for the beautiful dress goods for female wear, such as thibets and cashmeres and merinos, which are the most characteristic fabrics of the present century. The wool of this character produced in France surpasses that of any other country, and its possession has caused France to take the lead in this manufacture, which was not attempted in England until the wools from Australia were seen to develop similar qualities.

M. Benoville, in his admirable essay upon the combing wools of France, remarks:

"There are two facts we ought to proclaim abroad. The first is, that without the introduction of the Spanish race into our flocks, and without all the skill of our agriculturists, we should still vegetate in dependence upon neighboring nations, and should be reduced to clothe ourselves

¹ See article in the Appendix upon the "American Merino," by Dr. Randall, prepared since this report was submitted.

with their stuffs. It is to the admirable revolution in the raising of ovine animals that we owe the beautiful industry of spinning the merino combing wools. It is to this that we owe the splendor of the industries of weaving combing wool at Paris, at Rheims, at Roubaix, at Amiens, and St. Quentin.

"The second is, that the aspect, the quality, the character of our modern tissues—in a word, all that makes them deserve, for 40 or 50 years, the name of new inventions—are due principally to the particular nature of the combing wool obtained by the Spanish cross. There are few, very few inventions in the contexture of the stuffs, or in their mounting upon the looms, which are still the same as in the 18th century. It is because it has been favored by the wool of merinos that the 19th century has changed the physiognomy of the tissues of preceding ages."

The French merinos are bred to produce wool for combing purposes, as this always obtains the highest price. They are of unusual size, producing fleeces of uncommon weight. Those which have been introduced into this country were not regarded as profitable; partly for their want of hardiness under our system of husbandry, but mainly because there was no demand for their peculiar qualities of fibre. There can be no difficulty in engrafting the French race upon the American merino. We have then in our own material, and that which can be readily and advantageously produced by the improvement of our race, the means of supplying a manufacture which is one of the most important in France, and furnishes a large part of the exportation to this country.

SHEEP HUSBANDRY IN FRANCE.

As it is a matter of the highest interest, as well to the manufacturer as the agriculturist, that sheep husbandry should be made profitable in this country, it will be appropriate in this connection to refer to the tendency of sheep husbandry in France to secure the double purpose of profit from wool and mutton in the culture of the merino race.

A notice by M. Gayot, member of the Imperial and Central Society of Agriculture of France, upon the merino-ovine races exhibited at Billancourt during the period of the Exposition, furnishes some interesting information upon this point. After noticing the impulse which was given to French agriculture and manufacture by the development of the imperial flocks of the Spanish race at Rambouillet, and the tendency which prevailed for many years to cultivate the merino sheep for wool alone, and referring to the first effects of the importation of foreign wools in lowering the price of those produced in France, he observes that, at this period, the abandonment of the merino sheep was earnestly urged by many French agriculturists who had become possessed with an Anglo-mania for the production of the long-woolled mutton sheep. This agitation, although it did not procure the abandonment of the merino race, naturally modified it. The question was finally resolved that there was no incompatibility in the production of a very good quality of wool and

a satisfactory quantity of flesh. The sheep now produced in France, with this double destination, produce a wool of medium fineness, very much appreciated, and furnish for the butcher a return in flesh satisfactory in quantity and quality.

"The new merino," says M. Gayot, "is well formed; it grows rapidly; it produces abundantly a wool of medium fineness, but of a quality much sought for for the production of medium tissues, the consumption of which has a constantly ascending progression. It is easy of nourishment; it is more rustic and hardy than the foreign races; it fattens well, and at all ages, and furnishes a product in mutton which bears comparison with all others without disadvantage, and it is notably less adipose than the so-called perfected races of England."

The consideration last referred to will be appreciated in this country; the excessive fatness of the English mutton sheep, although not objectionable to the English laborer, being distasteful to American consumers.

"No one can deny," says M. Des Farges, in 1863, "that the growers in France, who have made a good selection, and have had in view the double end of wool and flesh, have obtained as much precocity and weight with the medium-wool merinos as with the mutton races. I have seen a lamb of seven months, killed by accident, which gave a net product in flesh of 24 kilograms, and in tallow of 4.50 kilograms; the skin was worth about 8 francs. Another lamb of 9½ months gave a product, in flesh, of 32½ kilograms, and in tallow of 3.930 kilograms; its skin was sold for 10 francs. The same grower sells regularly at his sheep-fold, for the butcher, his fat sheep, including the fleece, at 30 francs for animals six months old; for 60 francs at eighteen months, and for 80 francs at thirty months.

The change effected in the French merino is thus described by M. Gayot after giving the peculiar points of the old merino: "The ameliorators of the new race have had to fulfil another programme. At first they had only to produce a short wool; this alone implied great modifications in the skin. The folds disappeared upon a more ample body, which has become lower and more elongated, more filled out, more fleshy and less bone. It is a constant physiological result that, with a given race, the less the skeleton is developed, the longer becomes the staple of the fleece. Such, then, are the new characters deduced physiologically one from the other; a more cylindrical structure; a diminution in the volume of the bone; the disappearance of the folds of the skin; a suppression of the horns; a very notable contraction of the head and of the deformities which dishonored it; a descent of the wool upon the parts of the body where it had neither quality nor value; the choice pieces, the sides (*cotelettes*) and legs, become more marked and acquire more weight; the wool of medium quality becomes more abundant, and is at the same time soft and long; the growth of the animal is more rapid; the fattening more easy; the return of flesh greater, and the quality more appreciable."

It was observed that the fitness of the new merino race for the cultivated and populous districts of France was so marked that the exhibitors at Billancourt of animals of the small and fine-wool Negretti race displayed them with this published precaution: "In poor countries little advanced, where the pasturage is thin and the price of flesh will not cover the cost of production, the wool ought to be the principal and often the only product of sheep. We must then attempt to obtain as much wool as possible upon animals of small size and easy to nourish." It is for our agriculturists to determine whether the facts above given can be of practical application in this country.

ENGLISH COMBING WOOL.

The possession, by England, of the long-woolled races of sheep was the foundation of her manufacturing supremacy, the worsted manufacture supplied by this wool far surpassing that of clothing wool, and having opened the manufacture of cotton. More than half of the wool of England, whose annual product is about 250,000,000 pounds, is used for combing purposes, no wool of the merino race being produced. There is no more important question to American agriculture and manufactures, and no one more nearly related to the vital question of cheap sustenance, than the inquiry whether the long-woolled mutton sheep shall be produced abundantly in this country. The present consumption of this wool is about 6,000,000 pounds. The extension of the manufacture, which has been mechanically successful here, is limited by the supply of material; were this abundant the combed-wool industry would soon take its place by the clothing-wool industry, and double the products of the woollen manufacture. That there are no physical obstacles, such as condition of soil and climate, in this country to prevent the culture of the long wools of English blood, is demonstrated by the success in the culture of this wool in Upper Canada, from which province we obtain nearly all the long combing wool consumed here, our manufacture having been stimulated by the reciprocity treaty, which admitted these wools without duty. These wools are successfully and profitably grown in the neighborhood of Cleveland, Ohio, and also in Kentucky, where a new race of long-woolled sheep appears to have been formed. The inducements for growing long-woolled sheep, especially in the neighborhood of the great cities, are, that profit is derived from three sources—the mutton, lambs, and wool—each coming to market at different seasons. The value of combing wools, as compared with the merino clothing wools, has greatly increased, and, in all probability, will continue to do so. The English combing fleeces were worth, in 1855, only 1s. 1½*d.* In 1864, they were worth 2s. 4*d.* They had more than doubled in price while the clothing wools had just about held their price; the reason for this difference being that, while the demand for long lustre wool for the worsted manufacture has greatly increased, its culture has been confined to England, Holland, and parts of Germany, while the vast regions of

Australia, the Cape of Good Hope, and Buenos Ayres, have been opened to fine wool husbandry. American agriculturists differ as to the profit of growing the wool of English blood in the United States. On the one hand, the president of the New England Society of Agriculture asserts that "the mutton sheep of England are unsuited to our climate and soil, and are neither adapted to the extensive grazing lands where flocks are fed which are counted by the thousand, nor to the small farm which cannot furnish any luxuriance of food." On the other hand, the president of the National Wool Growers' Association, with more discrimination, asserts that the Cotswolds and Leicesters are well adapted to profitable breeding in the State of New York, for mutton and wool combined, in situations where the lands are rich, unsubject to drouth and adapted to root culture, and where good city mutton markets are easily accessible; he says, "they are great favorites with dairy farmers, and with grain growing farmers who wish to keep but few sheep." If the present high duties on combing wools shall stimulate their production, they should be continued. If they fail of this effect after a reasonable trial, the intelligence of the great body of the wool-growers will lead to the reduction of duties on these wools to a revenue standard. It is for the interest of the grower of the American merino wool, that there should be a supply of long wool to develop the worsted manufacture, that thereby a demand may arise for combing wools of merino blood, for the fabrication of the soft and fine stuff goods previously referred to, the command of both kinds of wool being necessary for a prosperous manufacture, in some fabrics one supplying the warp and the other the filling.¹

CHEVIOT SHEEP.

A race of sheep producing wool adapted for combing and special clothing purposes has been altogether neglected in this country. This is the Cheviot sheep, so extensively bred in Scotland in place of the old Highland breed, and which supplies the chief revenue of the vast estates of the noble families of Breadalbane, Argyle, Athol, Sutherland, and Buccleuch.

The introduction of these sheep would lead to the supply of a most valuable and much needed material for our manufacturers. The wool is sufficiently long to be combed and may be all converted into worsted. It is finer than the Cotswold, and can be advantageously mixed with English combing wool. Our worsted manufacturers, familiar with the working of this wool in Scotland, consider its acquisition for combing purposes, simply, as very desirable. It is, however, particularly desirable to supply an important deficiency of material for certain card wool fabrics. It is this wool, or a mixture of it, which gives their peculiar character to the Scotch tweeds and the Scotch cassimeres and coarser shawls. It is also extensively used at Rochdale for blankets, for which

¹ See letter of Mr. Walworth on "Combing Wools," in Appendix, not accessible when this report was submitted.

purpose it is specially fitted by being less liable to felt than the merino wools. We have invariably failed, in this country, in attempts to make goods corresponding to the Scotch cassimeres, so much in request.¹ The basis of these fabrics is the Cheviot wool, to which finer wools are added to give variety to the texture; their peculiar style resulting, according to the statements of Mr. Bowes, from the mixture of the coarse and long with short and fine fibre. These sheep resemble the Leicesters in general appearance, being without horns and having white faces and legs, though they are much inferior in size. They have an advantage over the Leicesters in their superior hardiness, as they thrive with conditions of keep and exposure under which the former would perish. Protected by their close fleece, which prevents the penetration of rain and snow, they bear with comparative impunity the storms of the Scottish hills and thrive on their pastures. Their limbs are of a length to fit them for travelling, and enable them to pass over bogs and snows, through which a shorter legged animal could not penetrate. In Scotland they have no other food, except when it is proposed to fatten them, than the natural grass produced on their own hills. The hardiness of the animals of this race, and the facility with which, unlike the Leicesters, they are nourished and tended in large flocks, would seem to fit them admirably for the rough husbandry of California, New Mexico, and the mountains of North Carolina. In the present state of our manufactures it is certain there would be an extensive demand for their wool.

Although it may seem presumptuous in a manufacturer to attempt to throw light upon the question of sheep husbandry, the object is more to disclose our necessities than to pronounce remedies. It is apparent that this most vital of all agricultural problems is very far from having been resolved in this country. England has resolved the question for her soil and climate, and has made the mutton sheep culture the pivot upon which her agriculture revolves, and the means of making her fields more productive in wheat than even the prairies of the west. In this country new elements enter into the consideration of this question; among them is the means of making our peculiar possession of Indian corn most available in the production of wool and mutton, and the relations of sheep husbandry to the culture of the beet for sugar, an industry destined to have a great extension at the west. Profit to the farmer and a supply of raw material to the manufacturer are not alone to be considered. With the increasing dearness of animal food the question of cheaper sustenance is coming to be as vital here as in Europe. The greater development of sheep husbandry, with a view to the supply of mutton as well as wool, will be the most efficient and quickest means of diminishing the cost of all animal food, as well as of increasing the supply of cereals by restoring our degenerating soil to remunerating cultivation. Happily the interests of sheep husbandry are receiving, in this country,

¹ Since the above was written, fabrics called Cheviots, similar to the Scotch goods, have been successfully made here.

more earnest and intelligent attention than ever before. There is no movement in American agriculture more encouraging than the vitality of the recent national, State, and county associations of those engaged in this branch of agriculture, and the vigor and talent with which the departments of sheep husbandry are conducted in the leading agricultural papers.

Recurring to the Exposition, the evidences of the vast scale upon which sheep husbandry is carried on in Russia, appearing in the notices of its exhibitors at Paris, could not fail to attract attention. Mr. Tilibert speaks thus of his flock: "It consists of 70,000 merino sheep. In 1864 it numbered 50,000 head, which gave 12,860 poods¹ of wool. Mr. Michel Bernstein, of Odessa, describes his production as follows: "The flock of Falz Feim consists of 400,000 animals. The last shearing produced 30,000 poods, washed, and sold for 870,000 roubles, or 2,974,500 francs."

Passing over the coarse wools of the Highland breed, the carpet wools of Russia and South America, the alpacas of Peru, and the Angora of Turkey,² all of which, with the exception, perhaps, of the latter, are of but little interest to the American wool producer, as they do not compete with any wools grown in this country, or which are likely to be grown, because other wool can be produced with greater profit, as it is not usual to raise rye on land which will raise an equal amount of wheat, the undersigned would observe that the interest displayed by all the continental governments of Europe in the introduction of valuable breeds of sheep is worthy of imitation by our own government. If the introduction, at the government expense, of valuable foreign breeds of sheep, to be confided to the Department of Agriculture, might not be deemed expedient, there is certainly every reason for favoring the importation of desirable breeds of sheep and other animals by annulling the duties on such importations.

¹ A pood is equal to 16.80 kilograms; .45341 of a kilogram is equal to one pound avoirdupois.

² See special paper upon the "Angora Goat," in the Appendix.

SECTION II.

WOOLLEN MANUFACTURES.

COMPARISON OF EUROPEAN AND AMERICAN MANUFACTURES.

COMPARISON OF EUROPEAN AND AMERICAN MANUFACTURES—ANTIQUITY OF FABRICATION IN EUROPE—CONSUMPTION OF THE WORLD—RELATIVE COST OF PRODUCTION IN THE UNITED STATES AND EUROPE—FRENCH WOOLLEN FABRICS AT THE EXPOSITION—CULTURE OF TASTE IN FRANCE—PROGRESS OF THE ART OF DYEING IN FRANCE—CHARACTERISTIC CENTRES IN FRANCE—BELGIUM, GERMANY AND AUSTRIA—GREAT BRITAIN—DUTIES OF AMERICAN MANUFACTURERS.

The American observer, astonished at the marvellous display of fabrics of woollen of such infinite variety and beauty at the Exposition, nearly all the products of European looms, might have been mortified at the meagre display from his own country, if he had not reflected that the woollen manufacture has hardly existed in this country more than half a century, and that even during its short existence it has been subject to a system of legislation which has been constant only in its instability. In Europe the woollen manufacture was the first art which revived after the dark ages. As early as 1395, the stuffs of Rheims sent to Bajazet II, for the ransom of French captives were regarded as the richest and most curious gift which France could offer. Both in France and England this industry received every favor which the state could render, and in the latter country its prosperity is the result of a persistent national care from the time of Edward III, unexampled in the history of industry. It could not be expected that the products of our brief experience should bear any comparison with the results of the traditions and inherited experience of centuries. The comparison of our fabrics as they were known to exist here, rather than as they were exhibited—for the display of our goods was very far from being an adequate representation of the real condition of our industry—was far from discouraging, while the recent progress in the most advanced nations gave the best assurance that we also might attain success in the boundless field upon whose borders we had entered.

The emotion most vividly excited by a general survey of the department under consideration was admiration of the wonderful qualities of the fibre, which is capable of producing objects and fabrics infinitely surpassing in variety of appearance as well as of application those produced from any other material, thus showing itself to be, of all fibrous materials, that of the first necessity to man. This fibre, we observe, is made more perfect than any other by the chemical elaborations of an animal of high organization, thus surpassing silk which is derived from an animal of a lower organic structure. Its specific gravity being the least

of all fibrous substances, its tissues are the lightest, warmest, and most healthful. This material, provided in some varieties with a structure which admits the fibres to be interlaced and intermingled by the process of fulling into fabrics distinguished for their warmth and softness, in other varieties has a lustre which assimilates its tissues to those of silk, and like silk and unlike cotton and flax it receives and permanently retains every tincture and every tone and hue which the art of the dyer can produce.

“Such,” as has been said by a recent writer, “are the qualities of fibre which have led every industrious nation to the culture of flocks as the first necessity of its people; which have caused, in every manufacturing nation, the demand to constantly exceed the supply; which have transplanted colonies from the Cape of Good Hope to Australia, and have carried the shepherd emigrant to the steppes of Russia and the plains of La Plata; and which have brought the present production to such enormous figures as are given by recent German estimates, giving to Great Britain an annual production of 260,000,000 pounds of wool; to Germany, 200,000,000; France, 123,000,000; Spain, Italy, and Portugal, 119,000,000; European Russia, 125,000,000; making, in all Europe, 827,000,000; in Australia, South America, and South Africa, 157,000,000; the United States, 95,000,000; the British North American Provinces, 12,000,000; Asia, at a very general estimate, 470,000,000; northern Africa, 49,000,000; the aggregate production of wool in the whole globe amounting, by these estimates, to 1,610,000,000, or a pound and a quarter to each inhabitant, reckoned at twelve hundred and eighty-five million people.”

The observer contemplating the woollen products at the Exposition as a whole would conceive that human ingenuity and imagination had been exhausted in the variety of form and application of this material; but upon comparison of the present fabrics with those which can be recalled by one of middle age it will be observed that nearly everything now seen is the product of modern times and was almost unknown in the past, the very variety or fantasy of stuffs being an idea of the present age, a variety not only due to the infinite combinations which are effected by modern looms, but by an alliance of woolly fibre with other materials, cotton, silk, flax, and the hair of the goat and vigne and alpaca, and by new dyes which modern chemistry has discovered. Seeing this, no one could fail to be impressed with the thought that of the great industries there is no one offering so wide a field for invention and imagination, and consequently no one whose pursuit is more identified with national progress in intelligence and taste. Looking more closely, but still somewhat generally, at the goods exhibited by the different nations, there might be observed a certain national character in each, which could be felt, but not easily described. It was an individuality like that which enables one to recognize the birthplace or race of a stranger by something of air or tone so slight that it can be hardly defined.

The products of the eastern nations were more marked; the carpets and rugs of Turkey showing a product from the broad-tailed sheep of Asia, the most ancient of the present races, and the fabric unlike anything made on our own looms, probably as old as the Crusades. The shawls of India, the most wonderful of all the monuments of textile labor, exhibit in the palm pattern a design which has probably been preserved for thousands of years, and a fabric called *espouline*, known from specimens still preserved to have existed as early as the year 835.

Coming to the European nations, and passing over France, for a more detailed notice hereafter, we observe in the cloths of the west of England, solid and strong as its oak, rather than soft and lustrous, the qualities which were given by the sturdy honesty of former times. In durability these cloths are unsurpassed by the fabrics of any nation. Their production is, however, an exceptional one, the tendency of the English being to manufacture for the utmost possible consumption of the masses without regard to wearing qualities. This is shown by the skill displayed by them in the adulteration of wool, by the substitution of cheap material such as cotton and shoddy in the filling, and by making warps wholly of cotton. In cheap or adulterated goods of admirable finish and appearance the English are unsurpassed. The introduction of shoddy as a manufacture was made by them, and they have consumed in a single year 65,000,000 pounds of this material, more than our whole clip of wool in 1860. In the use of new auxiliary materials in the woollen manufacture, such as the hair of the goat and alpaca, and even cow's hair, in the combination of wool with cotton warps in all the coarser fabrics from her own combing wool, and in the substitution of power for hand labor, the English surpass all manufacturing nations.

Belgium, although provided with little wool of native production, is noticeable for the excellence of its broadcloths, cassimeres, and doeskins, as well as for their cheapness, resulting from the exceedingly low cost of labor. In its combed wool fabrics it is distinguished for the facility with which it copies and appropriates and transforms into cheaper tissues the original designs of Roubaix and Paris.

Rhenish Prussia, having the command and the first selection of the incomparable wools of Germany, has preserved the reputation which it acquired in the 13th century and exhibits card-wool products, particularly the black-faced goods, which in excellence of manufacture, general utility, and cheapness, surpass those of any other nation.

Austria, with its leading manufacturing city, Brunn, in the very heart of the pastoral province of Moravia, is eminent for the originality of its card-wool fabrics, particularly those for women's wear, their showy and unique patterns, and for the vividness of its dyes. Nothing can equal the purity of the white cloths which form the uniform of the Austrian troops.

Russia exhibits a condition of manufacture similar but inferior to our

own, that of a young country of great enterprise and activity, but whose triumphs in the textile arts are still to be won.

The manufactures of the leading nations in card-wool fabrics may with propriety be ranked as follows :

Rhenish Prussia, first for men's wear ; France, first for women's wear ; Austria, second for women's wear ; France, second for men's wear ; Belgium, third for men and women's wear ; Prussia, fourth for men and women's wear ; England, fifth for men and women's wear ; the United States, sixth for men and women's wear ; Russia, seventh for men and women's wear.

In combing wool fabrics for women's wear France is first and England second, the other European nations showing nothing to particularly distinguish them from each other.

The districts in Europe distinguished for their excellence in card-wool fabrics were marked by the awards of gold medals, no medals of this class having been awarded to individuals. Gold medals were awarded to the Chamber of Commerce of Elbeuf, France, for the towns of Elbeuf and Louviers ; the town of Sedan ; the south of Scotland, comprising the towns of Dumfries, Galashiels, Hawick, Innerleithen, Langolm and Selkirk ; the west of England, comprising Gloucestershire and Wiltshire ; the province of the Rhine, Prussia ; the province of Silesia, Prussia ; the Chamber of Commerce of Brunn, Austria ; the arrondissement of Virviers, Belgium ; the arrondissement of the Riga, Russia.

The incompleteness of our exhibits very properly excluded this country from an award of the highest rank in this department.

It will be convenient in this connection to make a more minute comparison of our fabrics with those of European nations, having particularly in view our fabrics as they are known to be produced here. We cannot be said to occupy a national position in the woollen manufacture except in card or clothing wool fabrics, our success in other departments being exceptional. Our work has been in the direction demanded by the prime necessities of our people and the peculiar character induced by the nature of our raw material. Our peculiarly national wool manufacture is comprised in the production of all the varieties of card-wool tissues from flannels inclusive to the finest-faced broadcloths, which are only exceptionally included. Within this range, comprising plain, fancy, domet, and opera flannels, blankets, woollen shawls, satinets, the infinite variety of fancy and silk-mixed cassimeres, sackings, repellants, tricots, beavers Esquimaux, escredons, cloakings, our success has been complete and our progress within the last five years truly astonishing. In nearly all these productions we can vie with any nation in excellence, soundness, and taste of manufacture, and in some of them in cheapness. These goods it must be remembered furnish all the absolutely necessary card wool-clothing for our population, and all that the great majority of our people are inclined to wear at any time, a very small part of the population of the cities wearing occasionally, only, the fine and high-priced black

cloths. A small part of our population, it is true, prefer to purchase cloths of foreign make to distinguish themselves from the masses, but they are of the same class who in France, under the empire, when cotton stockings were prohibited, preferred smuggled cotton stockings to silk, because they could be only obtained at double the cost of the latter. Fashion all over the world demands the use for common wear of the medium mixed and fancy cloths in place of those of high finish. These we can produce from the admirable medium wools grown upon our own soil, and thus the American clothing-wool manufacturers and wool-growers are able to perform their part in one of the first duties of a nation, that of clothing its own people. In the class of goods referred to there is no need whatever of foreign supply, and none would be sought abroad if there were among us that national sentiment in favor of home production which prevails among the nations of Europe. Notwithstanding the freedom of exchange among European nations, the national sentiment is found to be the most efficient encouragement of domestic production. The lustrous German cloths so freely sold here find no sale in England. The London tailors who visited the Exposition reported that there was nothing on exhibition which would compare with the cloths of England. How different is the practice with the tailors and retail dealers in this country who persistently foster the unpatriotic prejudice in favor of foreign goods, because they can obtain larger profits on the foreign article than on the domestic, as the cost and quality of the former are less generally known than of the latter.

To specify more minutely the comparative qualities of American goods: In the whole range of fancy cassimeres, including the mixed goods of silks and wool, in style, taste, perfection of manufacture, and strength of material, we excel the English, and nearly approach the manufactures of France. The same may be said of the whole range of flannels, colored and plain, and of the Esquimaux and Moscow beavers, which we have imitated from the Germans. In the low cost pilots, used as substitutes for the beavers, slightly to the buyer but trashy in wear, it must be admitted that we can hold no comparison with the English. In all the grades of woollen shawls which can be fabricated of American wool we successfully vie in fabric and cheapness of price with the Scotch, who are confessedly at the head of this branch of manufacture. In the class of all-wool goods of light weight, made in all varieties of colors, denominated sackings and cloakings, and largely sold for women's wear, the fabrics are now sold in this country, at prices reduced to a gold standard, cheaper than any similar fabrics are sold in Europe. Goods of this character, displayed in the American quarter of the Exposition, and marked at their net gold prices, attracted great attention for their cheapness, and constant applications were made for their purchase.

In some other branches of the woollen industry, besides that of card wool, especially those where we have equal facilities with the European manufacturer in obtaining raw material, our productions bear a favora-

ble comparison. American carpets are fully equal, if not superior, to the English carpets of similar grades. In the American Brussels and tapestry carpets there is no inferiority in designs, colors, or texture. In fact they are woven here and in England by the same machinery. The American retail purchaser is invariably compelled to pay a higher price for a foreign carpet of the same grade; that is, he can purchase a better American carpet at the price of the foreign article. The American ingrain carpet, which is much more largely consumed, is unquestionably superior to the English. This is evinced by the fact that the yarns used in English carpets are not sufficiently strong to admit of their being woven in power looms, as is done in this country. There is a prevailing prejudice against American dyes in carpets as well as in other fabrics. No prejudice could be more unfounded. The same chemical agents and the same processes are used here as abroad. We have in our establishments the best dyers that the better prices of labor paid here can seduce from Europe. One manufacturer of opera flannels exhibits patterns of eighty different hues on one card. In the present state of the art of tincture in Europe and this country bad dyeing results not from want of skill, but the intentional use of cheap materials, and the risk of getting evanescent dyes is much greater in purchasing cheap imported goods than in buying the products of well-known American manufacturers, who only use inferior dyes when purchasers insist upon cheaper goods.

The following extracts from the last annual report of the National Association of Wool Manufacturers are confirmatory of the views above given of our recent progress in the woollen manufacture:

“During the war, the standard of excellence in our goods was undoubtedly far too low, and discredit was thrown upon our national production. Home competition, the inevitable result of protection, is now for excellence; and the vast improvement exhibited the present year is the subject of universal comment and surprise with the leading merchants. The leading organ of the dealers in dry goods—the *Economist*, a well-known free-trade advocate—declares as follows: ‘It can be truly said of our manufacturers this season, they have made wonderful progress over last year. Such continued improvements in the manufacturing of woollen goods will soon place us beyond the name of rivals, and cause our products to be imitated the world over, as our most choice styles and salable patterns are the result of American ingenuity, both in coloring and in style.’ As the admissions of an opponent are legitimate testimony, we may fairly quote in this connection the declaration of the same organ, that ‘a great impulse has been given to domestic manufacturers under the influence of the high tariff, and the result is seen in the splendid display made by our woollen mills.’

“Our progress has not been limited to improvements of old fabrics in style or economical production. Many new fabrics have been successfully achieved. Among the notable examples of recent introductions

may be specified the silk-mixed cloths, having threads of silk incorporated with both the warp and the filling; adding strength to the texture, and giving agreeable neutral shades to the surface. It is admitted that the American products of these goods, which are largely consumed, fall short in no respect of their German prototypes. The introduction of these goods is interesting, as aiding in the development of a kindred branch of American manufactures, all the silk used in these goods being spun in this country. The consumption of silk is by no means inconsiderable, that consumed by one manufacturer, for this class of goods, exceeding annually \$80,000 in value. The silk and wool manufactures are united in another fabric of great beauty, largely made in Connecticut—the Irish poplins, composed of worsted filling, which is covered completely by a warp of silk. This beautiful addition to our products of luxury, it is hoped, is the harbinger of a broader extension of the silk manufacture, which needs only sufficient protection to take its place in this country with the manufactures of wool and cotton.

“The great perfection which we have attained within the last two years in the manufacture of the class of cloths styled Esquimaux beavers, for overcoatings, is worthy of especial commemoration. Five years ago all the goods of this class, consumed in this country, were imported. The cheapness and excellence of the goods of this class recently fabricated here have led to the exclusion of the foreign product. The goods of this class, manufactured by the Germania Mills, exhibited at the Paris Exposition, received the award of a medal of high class.”

“Marked improvements have been made within the last year or two in the production of knit goods. Until quite recently the manufacture of shaped stockings, shirts, and drawers, made abroad wholly on hand machines, has not been attempted here. An American machine now performs automatically the narrowing and widening of the best class of knit goods, which is done elsewhere by hand. A great difficulty in the manufacture of knit goods has been the seaming, which, when done by hand, involved the distribution of the work to the homes of the skilled women by whom the work was finished at great cost. Within the last year a machine has been perfected by American ingenuity for seaming automatically. In one establishment a hundred little girls are employed on these machines, earning from half a dollar to a dollar a day, and accomplishing the seaming more perfectly than it was ever done by hand. Thus a completely shaped knit article is produced entirely by power, equal in all respects to the goods of the most celebrated English makers; while they are afforded at materially reduced prices.

“Of recent novelties in our manufacture, the fabrics which have attracted most admiration are the cloakings, so largely introduced during the present season. Even experienced manufacturers are astonished by the new range which is given to the application of woolly fibre, by the surprising variety of styles and effects obtained, and that they are capable of being produced by machinery. The models which gave the idea

of the fabrics produced here, originally conceived and executed in Austria, under a protective system of over seventy per centum, first appeared at the London Exposition in 1862, and were regarded as marked features of the Exposition. To the genius and enterprise of a young manufacturer of Rhode Island is due the conception of reproducing the Austrian inventions in this country. He was able to carry his conception into practical execution, by personal observation and actual labor in the Austrian mills. Not content with imitation, he introduced new styles and textures adapted to American wool; and the goods now produced by him, and by other manufacturers who have followed his example, although purely American in design, are in no respect inferior to the foreign models; while they are sold at from two to three dollars less than the prices at which the imported goods can be afforded, the American goods being woven by machinery, while the Austrian goods are woven by hand."

The highly respectable position occupied by the United States in the card-wool industry was indicated by the awards at the Exposition. It has been observed that no higher award than a silver medal was made to any individual or single establishment in this class. Among the 102 awards of the silver medal in this class, the 66th in number, and the first to an American exhibitor, was one for cloths manufactured by the Washington mills, of Lawrence, Massachusetts, exhibited as illustrative of the average styles and quality of the woollen goods now made in the United States. These fabrics, 30 in number, were not made for the Exposition, but represented the daily average products of the mill. Upon each sample a card was affixed, stating the selling price in this country. The jury, in making this honorable award, had in view the excellence and variety of these fabrics, their fitness for general consumption, and the reasonableness of the prices at which these goods are afforded in this country. The award was an important testimony in behalf of American fabrics, as the production of this mill, although undoubtedly equalled in quality as to some fabrics by many others here, is the largest in the country, and ranks among the most considerable in the world.

A silver medal, being the 67th in number, was awarded to the Webster woollen mills, of Massachusetts, S. Slater & Sons, for the admirable card-wool fabrics, consisting of black broadcloths, doeskins, castors, &c., produced in this establishment, their excellence placing beyond question our capacity of production in this department, with a sufficient supply of the requisite raw material. A bronze medal was awarded to Mr. H. Stursberg, of New York, for beavers, fully equalling those of German make, produced at the Germania mills, in Holyoke, Massachusetts. A bronze medal was also awarded to the Mission woollen mills, of San Francisco, California, for card-wool fabrics. The blankets exhibited from California would have done credit to any of the older States.

It is greatly to be regretted that no samples were displayed of our

productions in other departments of the woollen industry in which we have made much advance, as in carpets, knit goods, and delaines.

The department of combed wool manufactures, which in England and France employs the larger part of the capital and labor engaged in the woollen industry, we may be said to have scarcely entered upon, so vast is the field still unoccupied. Our progress in the cotton manufacture has directed our efforts principally to one branch of the worsted industry, the manufacture of the mixed fabrics with a warp of cotton and a filling of wool or worsted, which are classed under the generic name of mousselines delaine. In this manufacture we are favored by the character of our native wools. In consequence of the domestic manufacture of this fabric, the importation of printed delaines has almost wholly ceased, our goods being softer, owing mainly to the qualities of domestic wool, and taking color better than the competing imported fabrics. Of these goods not less than 60,000,000 yards are made here, which are all consumed in this country. This manufacture is peculiarly interesting, as one of the American establishments engaged in it was able to present to the Exposition a most honorable illustration of the manner in which the interests of the manufacturing proprietor, and the material, moral, and intellectual well-being of the workmen, are harmonized in this country.

A special jury was constituted at the Paris Exposition to award prizes to persons, establishments, and localities which, by a special organization or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen. In response to a call from this jury, the manager of the Pacific mills, situated in Lawrence, Massachusetts, presented a statement of the operations and conduct of this establishment, and received the distinguished award of a grand prize, consisting of a gold medal of the value of 1,000 francs and 9,000 francs in gold; similar awards having been made to 13 persons, establishments and localities in other parts of the world. The following facts are condensed from the paper of Mr. Chapin, which will be found in full in the appendix:

This establishment was erected in 1853, at a cost in capital of \$2,500,000. Its machinery is propelled by a fall of water of 1,500 horse-power. The average sale of manufactured goods, consisting of printed delaines and calicoes, has exceeded for some years past \$7,500,000. It employs about 3,600 work people; of these there are 1,680 men and 1,510 women; the rest consisting of boys and girls from 10 to 18 years old.

In the origin of the establishment provision was made to secure the material, moral, and intellectual welfare of the workmen, both as a duty to them and as a measure of self-interest to the proprietors. The *material* interests of the workmen are provided for by the construction of cheerful, comfortable, and well-ventilated workrooms; also, in the construction of dwellings for families of work-people, which are furnished at a rent equal to one-eighth of the wages of the head of a family; and, secondly, by the

erection of large buildings, used as boarding-houses, for the use of single females, whose residences are at a distance. These houses are provided with rooms accommodating two persons in each, the female operatives paying about one-third of their average wages for lodging, food, lights, and washing in these boarding-houses.

Another instrumentality for the material welfare of the workmen is an association for mutual relief, of which each person employed by the company *must* be a member. This association provides for any sick person who has paid from two to six cents, for at least three months, a weekly allowance for a period of at least 26 weeks, of from \$1 25 to \$3 75. In the course of 12 years this association, to which the company contributes weekly, has expended for the benefit of sick members a sum exceeding \$25,000.

For the *moral* protection of the large number of females employed by the company, the boarding-houses are controlled by persons carefully selected to influence this class of persons, and to act in the place of guardians. Unmarried men are never allowed to lodge in the boarding-houses, and married men only in rare instances, when accompanied by their wives. The doors of the houses are locked at 10 o'clock at night. It is impossible for an openly vile person to remain connected with the company. Men of intemperate or general bad habits are excluded, and it is an established principle that all profanity, or any bad example, or severe use of authority among the head workmen, must be strictly avoided, especially when these overseers have in charge females or young persons.

For the *intellectual* culture of the workmen there is a library, established by the contribution of one cent per week from each person employed, containing at present more than 4,000 volumes. This institution is under the control of the workmen. Separate rooms, supplied with newspapers and current periodicals, at all times comfortably warmed and lighted, and accessible at all hours, are provided for males and females. The number of work-people who cannot make use of this library, from being unable to read, does not exceed 50 in 1,000, and these are universally of foreign birth.

The advantages resulting to the employers from this care for the elevation and welfare of their operatives, and to workmen themselves, are: There have been no *strikes* among the work-people; they have been encouraged to feel that any grievance will be patiently listened to and frankly discussed, and the result has always been favorable to good order; a higher class of workmen has been secured, especially among the overseers, who engage the laborers in their different departments, and give a character to the mass; the work-people have been enabled to invest their surplus earnings largely in savings banks, such deposits largely exceeding \$100,000 at the present time; many work-people own houses free from debt, more than \$50,000 being thus invested; several workmen have become owners of the stock of the company—the stock so held has

a present market value exceeding \$60,000; many of the workmen have become members of the city government in its board of aldermen and common council; finally, the pecuniary success of the company has warranted a liberal payment of wages.

The least sum now paid in weekly wages to the youngest employé is \$1 82, gold, and the number belonging to this class is very small. Boys of 16 years do not receive less than \$2 85, gold, weekly. The least amount paid weekly to men is \$6 75, gold; while a very large majority receive much more. Females receive from \$2 48, gold, weekly, or about 12½ cents for the least, to \$6 72, gold; while a few earn more. This excepts young girls, whose wages are the same as the least sum named above. Spinners, weavers, and a few others, are paid in accordance with the product, some of them earning very large wages.

No comment is needed to give force or application to these facts, which may find their parallels at the Washington, Middlesex, and Salisbury mills, and most of the large establishments of New England. These facts can be better appreciated by comparing the social influence of the American system of manufacture, as above exhibited, with that of Roubaix, to be hereafter described, where fabrics similar to those of the Pacific mills are produced. The woollen manufacturers cannot claim for their industry alone the credit of harmonizing the interests of employers and workmen. They must divide their honors with the Lowells, Appleton's, and Jackson's, of the past generation, the early promoters of the American cotton manufacture, of which the woollen manufacture in New England, in its present form, is an offshoot. The benevolent forethought exercised by these excellent men to preserve the moral character of our rural population in the change to a new form of industry, whose influence elsewhere had proved so deleterious, is referred to by Mr. Nathan Appleton in his "History of the introduction of the Power Loom and the origin of Lowell." After modestly attributing to Mr. Francis C. Lowell, with whom Mr. Appleton had been associated since 1811, "the credit of having first introduced the new system in the cotton manufacture under which it has grown so rapidly;" and observing that Mr. Lowell's "care was especially devoted to arrangements for the moral character of the operatives employed," Mr. Appleton continues: "The introduction of the cotton manufacture in this country, on a large scale, was a new idea. What would be its effect on the character of our population was a matter of deep interest. The operatives in the manufacturing cities of Europe were notoriously of the lowest character for intelligence and morals. The question therefore arose, and was deeply considered whether this degradation was the result of the peculiar occupation or of other and distinct causes. We could not perceive why this peculiar description of labor should vary in its effects upon character from all other occupations. There was little demand for female labor, as household manufacture was superseded by the improvements in machinery. Here was, in New England, a fund of labor well educated and virtuous. It was

not perceived how a profitable employment has any tendency to deteriorate the character. The most efficient guards were adopted in establishing boarding-houses, at the cost of the company, under the charge of respectable women, with every provision for religious worship. Under these circumstances the daughters of respectable farmers were readily induced to come into these mills for a temporary period. The contrast in the character of our manufacturing population compared with that of Europe has been the admiration of the most intelligent strangers who have visited us. The effect has been to more than double the wages of that description of labor from what they were before the introduction of this manufacture. This has been in some measure, counteracted, for the last few years, by the free-trade policy of the government; a policy which, fully carried out, will reduce the value of labor with us to an equality with that of Europe."

The opprobrious epithet of "white slavery" has sometimes been applied to the labor in the New England factories. No aspersion could be more unwarranted. The founders of the prevalent New England factory system carefully purged it from every element of feudalism. They avoided the English plan, which had been at first introduced elsewhere, of employing families in the mill, often including children who should have been at school, the families being kept in a state of absolute dependence upon the mill, and exposed to suffering whenever there was any interruption in the business. They abolished the custom of payment by orders on a factory store, which tended to involve the workmen in debt and dependence, and instituted the practice of weekly payment of wages in money. They provided comfortable boarding-houses, which attracted work-people of mature age from the distant rural homes, to which they could return when the business of the mill was interrupted, a system which greatly favored the freedom of movement of the laborer, and they abjured all attempts to exercise political or religious control upon the workmen. In fact the independence of the laborer secured by these measures was one of the most marked features of the new era in the manufacturing business of New England.

A more important point of comparison between American and foreign fabrics is the relative cost of production of such manufactures, as we have most successfully achieved here, measured by the only correct standard, the relative expenditure of human labor required for such production. The solution of this question will determine whether we have such natural or acquired advantages as will justify the encouragement of this manufacture as a national industry. In pursuing this inquiry we can fix upon no single representative article of uniform quality and value; such as a ton of pig iron, the relative cost of which would determine the comparative advantages of the American or foreigner in the manufacture of iron. The infinite variety of cloths forbids the selection of any one as the standard of comparison, even if it were possible to obtain data from the books of foreign manufacturers. This question must be solved for the products of the card-

wool industry, generally, by comparing the efficiency of our system, processes, and machinery of fabrication. The many practical manufacturers who have recently visited Europe for the express purpose of studying its industries concur in declaring that, in these respects, we are on an equality with the most advanced nations. Laying aside the supposed advantages which we have in the possession of water-power, upon which far too much stress is laid in popular estimates, we apply everywhere in our fabrication of woollens the factory system and make the utmost use of mechanical power, while handicraft processes are still largely used abroad, especially in weaving. For the preparation of card-wool no machinery at the Exposition equalled in efficiency the American burring machinery exhibited there, such as is in general use here. In the carding of wool no improvements were seen at Virviers, one of the chief centres of the card-wool industry in Europe, which we do not have in use. About the same number of hands were employed at the cards as here. Spinning in large establishments abroad is usually performed by mules, while jack spinning is more generally adopted in New England, as better suited to the different qualities and quantities of yarns demanded by the variety of fabrics usually produced in our mills. The mules used here are of equal efficiency with those in the best mills in Europe. With respect to weaving, it was remarked that looms were being constructed at the machine shops at Virviers such as we would not put into our mills to-day. It was also remarked that no European looms for weaving fancy goods were shown at the Exposition which would bear comparison with the Crompton loom, and even upon that admirable machine great improvements are known to be in progress. The other processes of manufacture, such as dyeing, are the same as in Europe. When we take into consideration the greater energy and intelligence of our better fed and better educated workmen, the necessary use of every labor-saving process on account of the higher cost of labor here, and the admitted superiority in construction of American machinery, it may be safely asserted that a yard of cloth is made in this country with less hours of human labor than one of equal quality and the same degree of finish abroad. In other words, a week's labor will produce more yards of cloth in an American than in an European mill. But it is said that a yard of cloth costs less in Europe than in the United States. Even this statement requires qualification, for the American laborer can purchase here more yards of cloth by the produce of a day's work than the European laborer, the ratio of the price of cloth in this country, to-day, not being in proportion to the ratio of the rate of wages of ordinary labor. It is still true that the money cost of producing cloths is greater in this country than in Europe. From what has been said it is apparent that the greater money cost of fabricating cloths is not due to any want of natural advantages, or any deficiency in skill and effective labor on the part of the American manufacturer. It is not true of this industry, as is often asserted by theorists, that it has a sickly and hotbed growth,

sustained only by artificial stimulus, and rendering its productions as unnatural, to use Adam Smith's often quoted comparison, as that of wine produced from grapes grown in the greenhouses of Scotland. The higher cost of production in this industry is due, solely, to national causes inherent to the condition of a new country and a progressive people, to the higher rates of the interest on capital required to initiate and sustain industrial enterprise, and the higher rates of labor demanded by the greater social and educational requirements of our industrial population.

The facility with which capital is obtained abroad on account of the low rates of interest is an advantage which has been too much overlooked. The language of Burke, uttered 80 years ago, respecting the advantages of England over France, may be applied with equal force by all the nations of Europe to our own: "Our capital gives us a superiority which enables us to set all the efforts of France to rival our manufactures at defiance. The powers of capital are irresistible in trade; it domineers, it rules, it even tyrannizes; it entices the strong and controls the weak."

The following table showing the comparative rates of interest in England, France, and the United States is so instructive that no apology will be required for its reproduction:

Years.	England.		Bank of France.	United States.
	Market.	Bank.		
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
1846.....	3.79	3.21	4.00	8.35
1847.....	5.85	5.21	4.92	9.54
1848.....	3.21	3.71	4.00	15.12
1849.....	2.31	2.94	4.00	10.08
1850.....	2.25	2.52	4.00	8.02
1851.....	3.06	3.00	4.00	9.63
1852.....	1.91	2.15	3.21	6.42
1853.....	3.67	3.69	3.21	10.21
1854.....	4.94	5.31	4.33	10.37
1855.....	4.67	5.64	4.42	8.96
1856.....	5.90	5.90	5.54	8.92
1857.....	6.69	6.59	6.00	12.77
1858.....	3.15	3.23	3.67	4.99
1859.....	2.74	2.74	3.46	6.59
1860.....	4.42	4.42	3.67	6.80
Mean rate for the 15 years	3.90	4.02	4.16	9.12

In presenting this table, showing that the average rate of interest paid here during the 15 years ending with 1860 was more than double the average on the other side, Mr. Bigelow observes: "Remarkable as this difference may seem, it is such, in kind, as must always distinguish countries comparatively new, and partially settled, from those of longer standing. Neither the laws nor the condition of the United States can be considered favorable to great accumulations of capital. Existing, as

it does here, in amounts comparatively small and widely distributed, the price of its use must, in general, range high, so long as we have land in so large proportion to the number and wants of the population. The assimilation of our condition in this respect to that of England must of necessity be gradual and slow, awaiting and following the occupation of our yet unpeopled territory, and the full development of our internal resources."

The prices of labor abroad, details of which will be hereafter given, and particularly in Germany and Belgium, which are our most formidable competitors, will be shown to be not more than half the rates paid here, being reduced to the lowest sum which will support existence. Having placed ourselves upon an equality with other nations in enterprise and skill, our power of unaided competition has reached its limit, and our woollen industry could not sustain itself in competition with foreign production unless placed upon an equality in the command of capital, or unless the disparity against us were neutralized by legislative provisions. It is only to neutralize the foreign advantages of cheap capital and labor that protective, or, more properly speaking, *defensive*, duties are demanded by the woollen manufacturers. The duties on wool paid by the manufacturer, and theoretically reimbursed by the specific duties on the cloth, are demanded by the American wool-growers for the same reason. We speak only for our own industry, and with respect to that it is asserted, with the utmost confidence, that every spindle and loom employed in it would be stopped by the breaking down of the defensive barriers existing in tariff legislation. Capital and labor already employed with the utmost possible effectiveness, in the present state of the art, would not withstand for a moment an unaided conflict with foreign industry wielding capital and labor acquired at half the cost of our own. The feeble obstacle of transportation, so often magnified into an advantage in our favor, would be but a feather-weight in our scale of advantages. Abandon the woollen industry, and 200,000 workmen are thrown upon the land for employment; the markets for agricultural products for these workmen and their families would be cut off. Sheep husbandry, supported as it is solely by the American manufacture, with all its incidental advantages of supplying cheap food and enriching the soil, would be abandoned; its 200,000 laborers would be driven to other branches of agricultural labor. The coveted boon of cheap tissues would last only through the brief period during which our own manufacturing industry is being swept away. Apply this system to all American industry, and we become a mere agricultural people, vegetating in the hopeless apathy and upon the low plane of civilization of Turkey, Ireland, and our own southern States.

We may appropriately dwell at some length upon a point above adverted to, the absolute dependence of American sheep husbandry upon the domestic American manufacture. It has been often said that this country can advantageously grow wool for export. The fallacy of this notion is well exposed by Dr. Elder, who has compared our exportations of wool

with the importations of toys and playing cards to illustrate the insignificance of wool exports. In the seven years 1858-'64, inclusive, our aggregate exports of domestic wool to all countries amounted to \$1,725,799, and two-thirds of this was to bordering nations on our own continent, from whom we imported more wool than we exported. In the same period the toys and dolls imported were valued at \$2,483,489. In the year 1860 our exportations of wool to all the manufacturing countries of the globe were of the value of \$20,136, and our importations of playing cards amounted to \$19,238. It is clear that we have never had a foreign market for our wools, and the higher cost of labor which prevents exports of woollen goods must limit the production of wool to domestic consumption. The success of our domestic woollen industry thus becomes identified with our agricultural prosperity. Such considerations would seem to place it beyond all question that our national interests require that we should repel the cheap fabrics of Europe even at considerable sacrifice, that we may appropriate for ourselves the labor and profit of their production. Such was the conclusion of the continental nations of Europe, when peace restored the nations to labor, at the close of the great wars of Napoleon. England then had the command of all the markets of the continent, and was ready to fill them with her cheap fabrics; each nation of the continent refused them, and built up its barriers of defensive duties, and with what results to their own wealth, and the industrial progress of the world! "Instead of a single workshop Europe has the workshops of France, Russia, Austria, Prussia, Belgium, Sweden, Denmark, Spain; each clothing its own people with substantial fabrics; each developing its own creative genius and peculiar resources; each contributing to substitute the excellence of competition for the mediocrity of monopoly; each adding to the progress of the arts, and the wealth and comfort of mankind."

THE WOOLLEN INDUSTRY OF EUROPE.

Not the least of the advantages which the European manufacturer possesses is the superior facility which he enjoys of observing the processes and comparing the best products of the most advanced nations. It is hoped that the notices of the woollen industry of the leading manufacturing nations which follow may have some effect in stimulating our own manufacturers to study personally the operations of the most instructive establishments abroad, and at the same time convey to the general reader a more vivid impression of the important part which the woollen industry plays in the industrial movement of the world.

FRANCE.

England and France are nearly equal in amount of production, but in excellence France is at the head of all nations in the manufacture of wool. Her products are the most worthy of being our models. Her native wools most resemble our own. It seems appropriate, therefore,

that we should avail ourselves of the full information conveyed by the vast display of her products at the Exposition and the precise documents furnished by French publications of authority, and occupy a considerable portion of this report with statements respecting the French industry.

The leading woollen fabrics at the Exposition were arranged in two classes—29 and 30. Class 29 comprised yarns and tissues of combed wool, including combing wools, yarns of combed and carded wool, tissues of pure combed wool, flannels and fancy stuffs of wool carded and slightly fulled, and tissues of combed wool mixed with other materials. The principal centres of production of these articles in France are Rheims, Roubaix, St. Quentin, Amiens, Mulhouse, Saint Maine, Aux Mines, Rouen, Fourmies, Cateau, and, finally, Paris. The following facts are derived from the committee of admission of this class:

In 1835 the wools of France played relatively a more important part than at present in the supply of her manufactures. At that period the wools of Australia were little known, of which, in 1865, 23,000,000 kilograms were used. On the other hand the importations from Spain, Germany, Turkey, and Algeria have not lost their importance, having amounted, during the year 1865, to nearly 50,000,000 kilograms. The great increase of supply has come from Australia. These different wools are now combed and spun by machines of great perfection. The weaving of stuffs of wool or dress goods by power was hardly attempted in 1855, but since 1862 has had a rapid development, which increases every day. The weaving by hand has not diminished, but has remained nearly stationary, while the great increase of production is due to the use of machinery driven by power. The number of workmen employed in power weaving is much less than those working at home by hand. The number of females employed in combing, spinning, and weaving is estimated at about one-half the whole number of operatives in some districts, and one-third in others. All the combed wool fabrics made in France have been much lowered in price since 1855. The exportations of manufactures of wool of all kinds have increased from 165,000,000 francs (\$33,000,000) in 1855, to 396,000,000 francs (\$79,200,000) in 1865. The yarns and stuffs of combed wool are valued at 279,000,000 francs, (\$55,800,000.) The improvements observed are: new methods of combing and spinning; ingenious means of printing, facilitating the labor of the workman and the effectiveness of the machine; and the application of the products of aniline as a dyeing material.

The French products of class 30, comprising yarns and tissues of carded wool, form four principal series: 1. Soft, black, and uniformly colored cloths, cloths for billiard tables and carriages, black-faced goods, called satins, and beaver cloths; 2. Fashioned or fancy cloths for pale-tots and women's garments; 3. Novelties for pantaloons; 4. Articles for waistcoats and complete garments. These products are manufactured by establishments situated in five principal groups:

1. The group of Normandy, the centre of which is the town of Elbeuf. This city and Louviers, and the towns of Vire, Lisieux, and Romorantin, produce specially fabrics for general consumption, such as fancy and pilot cloths, novelties for pantaloons, and articles of wool velvet, and cloths for women's garments.

2. The group of Ardenne, the centre of which is Sedan; here fine black broadcloths and cassimeres are largely manufactured, as well as cloths for paletots and wool velvets.

3. The group of St. Isère, the centre of which is Vienne, which produce generally articles of low price for pantaloons, paletots, &c.

4. The group of High Rhine and Moselle, the centre of which is Bichwaller, which produces the fine-faced black cloths, called satins. The heavy stuffs for country use are made chiefly at Nancy.

5. The group of the Midi, comprising the towns of Carcassone, Mazamet, Saint Pons, and Bidarieux, which produce all the tissues of low price mentioned above.

The greater part of the wool employed in the card-wool industry comes from abroad; the ordinary French wools, from unimproved races, being used for the common cloths. Hand labor is almost everywhere replaced by power. Hand-weaving is employed only for the fabrication of articles, the designs of which, being subject to the caprices of fashion, are required to be in great variety, such as stuffs for pantaloons, waistcoats, and garments for ladies' wear. It is observed that power-labor, by reducing the price of the manufactured article, causes greater consumption, and employs more workmen. It is estimated that the manipulation of card-wool stuffs, and the general expenses, taking the winter and summer goods together, add one-third to the cost of the raw material. The number of workmen employed by patrons in manufacturing establishments, or mills, properly called, is estimated at nearly two-thirds of the total number; the rest work by hand at their own homes, but in both cases they generally work by the piece. The women employed in the card-wool industry comprise about two-fifths of all the laborers. The goods are generally sold directly to the great commercial houses of Paris and the departments, and these send commercial travellers through France and abroad to place their goods. The exportation of card-wool fabrics in 1865 was about 5,500,000 kilograms, of an approximate value of 71,000,000 francs. The annual production of these fabrics is reckoned at about 250,000,000 francs.

GENERAL FEATURES OF FRENCH INDUSTRY.

Before proceeding to a description of the several centres of manufacture it will be proper to refer to the general features of the French woollen industry. Some passages from "The Fleece and the Loom,"¹ published in 1866, may be appropriately quoted in this connection:

"In studying the characteristics of the French manufacturers, and the

¹ Address before the National Association of Wool Manufacturers, by John L. Hayes.

part they have taken in advancing the general progress of the woollen industry, and in adding to the means of consumption, we observe that they have not attained that economy of production which so eminently distinguishes the British manufacturers. Supplied with abundant labor, supported by cheap sustenance, the French manufacturers have been content to remain far behind the British and Americans in the substitution of machinery for human labor. But the tendency of machinery, as they think, is to give mediocrity to manufactured products; and the French aim at the utmost excellence in their works. The individual skill or handicraft of the workman is developed to the utmost extent. All machinery is rejected which will not surpass the manipulations of the hand. Spinning, the foundation of good textures, is carried by them to the utmost perfection. Yarns, spun from combed or carded wool by the rival nations, exhibited at the great London Exposition, were carried 10, 20, and even 30 numbers higher by French spinners with the same wool. They excel equally in ameliorating raw materials, in making them softer and more flexible. The French, in the textile arts, are creators; while the English are *exploiteurs*. The one nation invents new fabrics, new combinations of old materials, new styles and patterns, or what, in a word, are called French novelties. The other works up these ideas, copies, transforms, dilutes, and, above all, cheapens. Most other nations follow the English example, and our own is as yet no exception. To specify the contributions of inventive or creative genius of France to the woollen industry, we must class, first among the machines, the Jacquard, already referred to, whose wonderful products are seen in all figured textures; and next, the machinery for combing wool and also cotton, of Heilman, of Mulhouse, an invention which possesses interest, not only on account of its vast importance, but the circumstances of its origin. The most novel and valuable part of this machine, as stated by the inventor, which he had long unsuccessfully endeavored to obtain, was ultimately accomplished by carrying into mechanical operation a suggestion which occurred to him while watching his daughters combing their hair. He was at that time meditating on the hard fate of inventors generally, and the misfortunes which befell their families. This circumstance, says Mr. Woodcroft, being communicated to Mr. Elmore, of the Royal Academy, was embodied by him in a picture which was exhibited, and greatly admired, at the Royal Academy in 1862. We all practice or use French creations without suspecting their origin. Before 1834 the colors of all fulled cloths were uniform. At that time Mr. Boujean, of Sedan, conceived the idea, to give beauty to the productions of his looms, of uniting in the same stuff different tints and figures. His thought was that the domain of production would be as illimitable as that of fantasy, which was the name given to his goods. He was the originator of the product and name of fancy cassimeres, by far the most important branch of our own cloth manufacture. The French, already skilled in making light gauzes of silk, first made *baréges* in 1818; a fab-

ric with a weft of wool and warp of silk. The English imitated the fabric by substituting cotton for silk in the warp. In 1826 M. Jourdain first produced, at the establishment of Troixvilles, that invaluable fabric, *mousseline delaine*, made of fine wool, for printing. In 1831 the manufacture and printing of this tissue was fully developed. In 1838 he also created *challis*, made of a warp of silk organzin and a weft of fine wool. In 1833 first appeared at Paris, simultaneously introduced by three French houses, that fabric so appropriate for the consumption of the masses, the *mousseline delaine*, with cotton warps. The English adopted the manufacture in 1834-'35, and it prevails in every manufacturing nation. This fabric, which is unquestionably a French idea, has been an inestimable blessing. Its products are counted by millions of pieces, and it enables the most humble female to clothe herself more comfortably and becomingly, and as cheaply, with wool, as she could 30 years ago with cotton. In 1858 plain *baréges* were introduced, for printing. These had before been made of colored threads; at the same time *balsorine*, having the effect of alternate fabrics of cloth and gauze, was created in wool in imitation of a flaxen fabric. The *foulards*, with a warp of silk and weft of English combing, were introduced about this time at St. Denis. The fabric, however, most appreciated by female taste, and the most unrivalled of modern woollen textures, and the only one not degraded by imitation, is that beautiful material which derives its name from the fleece of which it is made, the French merino. This tissue was first made at Rheims, in 1801, by a workman named Dauphinot Palloteau. The invention, for which a patent was asked, whether successfully or not is not known, consisted solely in the adaptation of a peculiar type of wool, and not in the fabric. * * * *

"The creative genius of the French is more conspicuous in their arts of design and color, as applied to all textile products. There is an unlimited application of these arts and a boundless field for novelties in the modern use of printed woollen goods. All the manufacturers of France, in producing new styles of fabric or figure, nourish their tastes by Parisian ideas, the inheritance of the ancient splendor of Versailles. Says M. Benoville: 'At Paris each consumer is a judge, and becomes a guide to the merchant and manufacturer. The Parisians appreciate only what is good, and consecrate only what is beautiful. The grisette as well as the *grande dame*, the artisan as well as the dandy, has received, and practices without knowing it, the traditions of art.' Although important commercial houses are now established for the sale of designs elaborated in this school, there is no manufacturer in Europe who scruples to copy French patterns. We have even so framed our patent laws that, while protecting all other foreign works of invention, we might appropriate with impunity the works of the Parisian pencil and pallet.

"Thus, by importation as well as imitation, all over the world, the true lovers of the beautiful, as well as 'the sophists, economists, and calculators,' whose advent, upon the fall of Maria Antoinette, is so patheti-

cally lamented by Burke, acknowledge France, so gracefully symbolized by Eugénie, the empress of taste and fashion."

CULTURE OF TASTE.

The modes in which taste is cultivated in France deserve study and imitation in this country. They are illustrated by the observations of Doctor Ure upon the habits of the silk weavers at Lyons.

"Among the weavers of the place, the children and everybody connected with devising patterns, much attention is devoted to everything in any way connected with the beautiful, either in figure or color. Weavers may be seen in their holiday leisure gathering flowers and grouping them in the most engaging combinations. They are continually suggesting new designs to their employers, and are thus the fruitful source of elegant patterns.

"There is hardly any considerable house in Lyons in which there is not a partner who owes his place in it to his success as an artist. The town of Lyons is so conscious of the value of such studies that it contributes 20,000 francs per annum to the government establishment of the School of Arts, which takes charge of every youth who shows an aptitude for drawing, or imitative design of any kind, applicable to manufactures. Hence all the eminent painters, sculptors, even botanists and florists of Lyons, become eventually associated with the staple trade and devote to it their happiest conceptions. In the principal school, that of St. Peter's, there are about 180 students, every one of whom receives from the town a gratuitous education in art for five years, comprehending delineations in anatomy, botany, architecture, and loom pattern drawing. A botanical garden is attached to the school. The government allows 3,100 francs a year to the school of Lyons. The school supplies the scholars with everything but the materials, and allows them to reap the benefit of their works. Their professor of painting is a man of distinguished talent well known to connoisseurs.

"The French manufacturer justly considers that his pattern is the principal element of his success in trade, for the mere handiwork of weaving is a simple affair with the improved Jacquard loom. He therefore visits the school and picks out the boy who promises, by taste and invention, to suit his purpose the best. He invites him to his home, boards him, and gives him a small salary, to be gradually advanced. One gentleman told Doctor Bowring that he had three such youths in his employment, to the youngest of whom he gave 1,000 francs, or £40, per annum. After three or four years, if the young artist's success be remarkable, he may have his salary raised to double or treble that sum; and when his reputation is once established, he is sure of the offer of a partnership. Such is the general history of many of the schoolboys of Lyons. Even the French weaver, who earns only 15*d.* or 20*d.* a day, prides himself upon his knowledge of design; he will turn over several hundred patterns in his possession and descant on their relative merits,

seldom erring far in predicting the success of any new style. By this disposition the minds of the silk weavers in France become elevated and refined, instead of being stultified in gin shops, as those of the English too frequently are. In flower patterns the French designs are remarkably free from incongruities, being copied from nature with scientific precision. They supply taste to the whole world, in proportion to the extent of their exportations, which amount to 110,000,000 out of 140,000,000. In the Lyons school collections of silk fabrics may be studied, extending over a period of 4,000 years, with explanations of the modes in which every pattern was produced, from the rude silk of the Egyptian mummies to figured webs of the last year."

It is worthy of mention that the Chamber of Commerce of Lyons solicited and obtained from the French government permission for M. Chevrueil, the eminent director of the dye works of the Gobelins, to lecture to the artisans of Lyons upon the "Laws of the simultaneous contrast of colors," which he discovered and has so ably elucidated—laws which, once demonstrated, become a means of assorting colors so as to obtain their best possible effect, and make the principles of taste which govern the arrangement of colors as definite as the harmonies of music.

DYEING IN FRANCE AND CONTRIBUTIONS OF MODERN SCIENCE TO THE ART.

There would be but a limited field for the exercise of taste in the textile industry without the art of dyeing, which is to tissues what the summer's sun is to the landscape, the source of all which delights the eye in light and color. While admiring the splendors of impression and color displayed upon the fabrics of the present day, we should not forget how largely they are due to the intelligence and science of the French statesmen and savans of former generations.

The great Colbert in establishing manufactures in France, made improvements in the art of dyeing the object of special care. He published in 1672 a set of regulations "for the dyeing of wools and the manufacture of wools of all colors," and showed that dyeing was an object deserving public attention from the additional value which it confers upon many of the articles of commerce. "If the manufactories of wool, silk, and thread are to be reckoned among those which contribute most to the support of commerce, dyeing," says Colbert, "which gives them that striking variety of color by which they resemble what is most beautiful in nature, may be considered as the soul of tissues, without which the body could scarcely exist. Wool and silk, the natural color of which rather indicates the rudeness of former ages than the genius and improvement of the present, would be in no great request if the art of dyeing did not furnish attractions which recommend them even to the most barbarous nations. All visible objects are distinguished and recommended by colors, but for the purposes of commerce it is not only necessary that they should be beautiful, but that they should be good,

and that their duration should equal that of the material which they adorn."

These ideas bore fruit in the magnificent tapestries of the Gobelins manufactory, and more usefully in the famous black cloths of Sedan, both of which are due to this great statesman. The art of dyeing was also during his time applied to printing cottons. The industry of calico printing was founded in Holland during the 17th century by a native of France. It was planted by a Frenchman in 1690 upon the banks of the Thames, and established about that time by a French refugee at Neufchatel, from whence it was brought back again to the country of its nativity by the celebrated Oberkampf. The regulation of the art of dyeing continued after the time of Colbert to be an object of governmental care in France; and Hellot, Macquer, and Berthollet, all eminent chemists, were successively appointed to superintend the practice of dyeing and to cultivate the branches of science which had a tendency to promote the progress of the art. Each of these chemists left practical treatises upon dyeing, of great value. The work of Berthollet, published in 1791, became the standard book of the age, since it contained not only a detailed account of the practical operations of the art, but theoretical views of the principles upon which it was founded. These works, and that of Chaptal, who while occupying the office of minister of the interior, had become interested in the art, contained nearly all that was valuable respecting the art of dyeing in any language at the close of the last century. The best informed Englishmen of that period, such as Mr. Anderson, author of the "History of Commerce," and Mr. Howe, author of an essay on bleaching, did not hesitate to admit the superiority in brilliancy of color of the articles of French manufacture of this period, and to attribute it to the fostering care of the government.

The Exposition of Paris has called forth a beautiful study on the dyeing and printing of fabrics from M. De Kaepplin. This treatise, the more elaborate work of M. Schutzenberger, published in 1867, under the auspices of the Industrial Society of Mulhouse, and the admirable report of Dr. Hoffman, president of the Chemical Society of London, published in 1863, furnish ample information as to the progress of the art in this century. A signal step in the advancement of this art was the discovery by the celebrated Vauquelin, in the early part of the present century, of the metal chromium the compounds of which have since had so many industrial applications, especially in the printing of mousselines and calicoes, as in the chromate of lead first prepared for printing cottons by Lassarque in 1819, and the oxide of chromium combined with arsenious acid to form green, applied by Courez. In 1810 Loffet introduced the process of fixing colors by means of steam to the printing of cashmere shawls, thus dispensing with the immersion of the fabrics in a bath of tincture. During the years 1837, '38, '39, '40, and '45, the beautiful discovery of Loffet received its most remarkable application in the fabrication of mousselines of wool, and wool with warps of cotton, by means of colors fixed by steam. It was

this application which gave the vast extension to the manufacture of printed woollen tissues, which constitute at present the most important part of the combed-wool industry of France, and the only branch which has been successfully pursued in this country. The application of steam colors to cotton fabrics was greatly advanced by the discovery of stannate of soda by Mr. Steiner, which enables the colorist to give to the steam print a solidity and lustre in which it was wanting before.

Of the modern discoveries in chemistry there is none more brilliant than that of the cheap production of ultra-marine, which was effected by Guimet in 1828, the right being secured to him by patent. This material, affording a blue color of surpassing intensity and purity, was formerly supplied by levigating the powder of the mineral *lapis lazuli*, obtained in small masses from Siberia. Its value in the arts was 125 francs an ounce, more than its weight in gold. The artificial ultra-marine is produced by combining the same chemical substances, the soda, silica, sulphur, and alumina which are found in the lapis lazuli, and is equal in brilliancy of color to the natural ultra-marine. Its cost has been reduced from 6,000 francs to 6 francs the kilogram. The first impressions were made with this color, fixed by albumen upon mousselines delaine, in 1834, and in the richest fabrics of France this beautiful color replaces the duller tints formed by indigo and prussian blue, the latter dye having been fixed upon woollen tissues as a color of impression in 1836.

We must not pass over another series of inventions, although they have special relations to the printing of cotton fabrics. For the printing of cottons madder is by far the most important material on account of the permanency of its dyes. The extensive demand for this material and the desirableness of obtaining brighter tints has made it an object of the highest importance to free the coloring principle of the madder root from extraneous matters. The French chemical manufacturers have achieved remarkable results in this direction. In 1826 MM. Robiquet and Collin discovered in the madder root the principle *alizarine*, formerly a rose-colored dye, which the English afterwards introduced as a commercial article under the name of *pincoffine*. In 1828 purpurine, also derived from madder, was indicated by the same chemist as a chemical species distinct from alizarine. It furnishes a more vivid red than the alizarine, and is now prepared commercially. Since the period last mentioned the coloring matter of madder has been concentrated in the form known as garancine and flowers of madder. These materials are prepared commercially in France in vast quantities, their use proving greatly advantageous, both in respect to economy and improvement of color. The dyeing powers of purpurine and alizarine are remarkable, that of purpurine being equal to forty or fifty times the same quantity of madder, and that of alizarine to that of thirty-eight times that of madder. These new substances have been found valuable in dyeing wool. Wool mordanted with alum and cream of tartar gives, with purpurine, a brilliant crimson

red, and mordanted with tartar and a solution of tin gives, with purpurine, a scarlet almost as fine as that from cochineal.

The advantages resulting from the recent improvements by which the coloring matter of madder is obtained in a purer and more concentrated form will be rendered more obvious by a brief statement of the usual processes in printing. These may be divided into three principal classes: First, where the colors are fixed without a mordant, as in dyeing blue with indigo, either of a uniform tint, or where the whites are reserved by an application which prevents the contact of the dye upon the parts to remain uncolored. Second, where mordants are first printed upon the tissues, which are afterwards subjected to subsequent operations of tinctures, as by immersion in the dyeing liquid, &c. This process until very recently has been necessary for all madder dyes. Third, where the mordants and coloring matters are previously combined together to form the color to be impressed, which is called a "color of application." In this last class of processes the printed tissues are suspended in a vessel filled with steam from boiling water, which produces the same effect as dying by immersion in a liquid bath, the colors combining directly with the fibres of the tissues. By means of the steaming process, the operator can print and fix at once an indefinite number of colors, and terminate by the two or three operations of printing, fixing, and washing a work, which formerly required many weeks when accomplished by the process of dyeing after the printing with mordants; almost all the coloring materials known could be fixed by the third process upon tissues of wool, silk, or cotton. The coloring matter of madder alone has not been isolated in sufficiently advantageous conditions of assimilation, that the process of fixing by steam could be applied to it. The discovery of the different purifications of madder has placed it in the power of the printer of tissues to apply the expeditious process of steam printing to the most permanent and useful of all vegetable colors. The most important use of madder as a color of application has been achieved only within a few months. Very beautiful fabrics printed by this process at two establishments, one in France and the other in Bohemia, were displayed at the Exposition. M. De Kaepplin, referring to these fabrics, says, "It is evident that the long and difficult operations required for fixing the vegetable coloring material on tissues are now quite simplified, and that the new manner of fixing the coloring material of madder, all prepared and combined with the different mordants, being allied with the beautiful and simple fabrication of colors from aniline, will achieve for the industry of printing tissues its most beautiful conquest. Instead of the ancient steam colors, which in respect to solidity left much to desire, the madder colors, married as it were with the brilliant colors derived from coal tar and the solid and resistant mineral colors, like ultramarine and chrome green of Guignet, will replace the fugitive colors of the dye woods. The fabrication will be more perfect, and will reunite solidity and brilliancy of colors with the delicacy of execution which can be obtained only by machines which print mechanically."

It has long been known that certain species of lichen exposed simultaneously to the action of ammonia, moisture, and a moderate temperature, gradually acquire a deep purple color, and the property of dyeing wool and silk with pure and brilliant tints. The pasty and woody mass containing the coloring matter is known as eudbear. The coloring matter extracted by means of an alkali and separated from the woody portions is known as archil or *orseille*. A new kind of archil was introduced in 1856 by MM. Guinon, Marnas, and Bonnet, under the name of French purple, in the form of lime lake. It furnishes very fine and pure mauve and dahlia tints upon silk and wool without mordants, and mixes easily with other coloring matters, such as ultramarine, indigo, carmine, cochineal, aniline red, &c., producing the most varied and delicate tints. The manufacture of French purple, although at one time extensively prosecuted, has been greatly diminished in importance by the competition of the coal-tar purple.

In 1854 MM. Hartmann and Cordillet succeeded in fixing upon fabrics the green coloring matter of leaves. In 1851 and 1852 the famous Chinese green, called *Lo-kao* was introduced. Subsequently M. Charven, of Lyons, obtained the coloring principle of the *Lo-kao* from a weed indigenous to Europe, the *Rhamnus catharticus*, for which he received a gold medal. The Chinese green was especially admired on account of the beautiful green shades which the fabrics dyed with it assumed in artificial light. MM. Guinon, Marnas, and Bonnet discovered the means of producing at less cost shades of green which preserve their character under artificial light by the use of Prussian blue with picric acid. It is a curious fact that, while the greens produced by indigo and picric acid appear blue in artificial light, the dyes produced by Prussian blue and picric acid appear green.

A remarkable and very beautiful amaranthine red was first commercially prepared from uric acid in 1856. This dye, called *murexide*, created a great sensation, but its use was of short duration, as a more vivid and more easily applied tint was about this time obtained from aniline, and the murexide was objectionable because the color, though unaffected by the sun, was destroyed by sulphurous fumes, as in the atmosphere of London, impregnated with sulphur from coal. This coloring material is peculiarly interesting from the circumstance that it is nearly identical in composition with the ancient purple derived from the murex. Professor Hoffman records, as he shared, the triumph which was felt in Liebig's laboratory when a few grains of this substance were first obtained in a state of purity, and the rapidity with which the scientific discovery was made practical in the arts. When the manufacture reached its culminating point, the weekly yield of murexide in one factory only amounted to no less than 12 cwt., a quantity in the production of which 12 tons of guano were consumed.

The long-sought-for rediscovery of the Tyrian dye was hardly attained before it was replaced by a product of modern science. The year

1856 was remarkable in the history of dyeing as the epoch of the most complete revolution of the art. It was the period of the practical discovery of the first aniline colors. The property which aniline, a product from the hydrocarbons of the coal series, possesses of forming colored compounds, was indicated by Runge in 1856. This indication was followed by the discovery by a young English chemist, named Perkins, of the means of preparing commercially from aniline a coloring substance of great intensity of hue and permanency, which is known in the arts as the "Perkins violet." This was almost immediately followed by the commercial preparation in France, by Verguin, of the aniline red. The extraordinary qualities of these products, the wonderful facility with which they could be applied to wool and silk, and the freshness and vividness of their hues, stimulated the scientific and practical chemists in France and England to search for new compounds from the same source, and to cheapen the production of those known. The most important scientific results were obtained by the English chemist Hoffman, who discovered and prepared the colorless rosaniline, a base from which all the reds, besides many other colors, may be formed, by different reagents. The colors derived from the hydrocarbons of the coal series are as various and as vivid as the hues of the flowers.

The aniline colors whose use in the arts has been fully established by practice, are:

1. The aniline, or Perkins violet, called also rosaline, indesine, mauve, aneiline, hamaline, and violene.
2. The aniline reds with a rosaline base, called also fuschine, azaleine, and magenta.
3. The blues of rosaniline, Lyons blue, blue *de lumiere*.
4. The rosaniline violets, different in hue from the Perkins violet.
5. Hoffman's violet.
6. Imperial dahlia.
7. Aniline green.

To these may be added an orange color, chrysaniline, and colors produced from the oxidation of aniline, but not directly applied; a green called emeraldine, a blue called azurine, and the intense aniline black, developed only on vegetable fibres.

The use of these colors gives a marked character to the dyed tissues of the present age. The great change effected by them was remarkably illustrated at the Exposition by a display of parallel series of wools dyed by the ancient, and the new or aniline processes. The aniline hues were predominant in the richly colored fabrics of the Exposition, and, adopting the figure of Colbert, that "color is the soul of tissues, without which the body could scarcely exist," we might say that these colors fix the *psychological* character of the fabrics of the present day. Among the wonders of modern science what is stranger than this, that the gigantic plants buried in the coal measures of the ancient world are made to bloom with all the tints of the primeval flowers, upon the tissues of modern industry?

Artistic reasons are not the only ones which have led to the prevailing use of the new dyes; economical reasons have had equal weight, especially in the woollen industry. One of the most remarkable characters of the coloring materials derived from aniline is the powerful affinity which they possess for materials of animal origin, or nitrogenized substances, and especially for wool, silk, albumen, gluten, and caseine. The affinity for these substances is so great that there is no need of any mordant. In the application to vegetable tissues, such as cotton, it is only necessary to animalize the fibre with albumen. These colors may not only be applied with the greatest facility in dyeing by immersion, but add vastly to the economy of printing mousselines or calicos, as they may be used as "colors of application" in steam printing. Besides, all these colors are now sold commercially in a state of great purity, and very often in crystals. The colorist has rarely anything more to do than to dissolve the product in a suitable vehicle, and to put it in presence of the fibre, in the conditions in which it can adhere, which for wool and silk are extremely simple.

The great problem in the art which science has now to resolve is to give more stability of color to these magnificent products of modern chemistry. The chemist who has furnished many of the facts above given, M. De Kaepplin, is hopeful that this will be accomplished. He says: "Some of these results have already been obtained; above all, upon tissues of wool and silk. It is evident that colors derived from archills, such as the violets and reds, are more fugitive than the Perkins violet or new violets from rosaniline of Pourier and Chappal; that the roses of safflower or cochineal are not more stable than the roses of aniline, and that aniline black is not only superior to all other blacks, but that it is wholly unalterable and of complete stability upon tissues of cotton."

Before closing this imperfect review of the relation of chemical arts to the woollen industry, it is due to American science to observe that the name of the lamented Dr. Dana, of Lowell, is most honorably mentioned by French savans among those who have rendered important service to the art of dyeing and printing tissues. The credit is awarded to him of the introduction of lime in the operation of bleaching for the purpose of saponifying the fatty matter contained in the crude tissues. He thus completed the great discovery of Berthollet of the bleaching qualities of chlorine.

CHARACTERISTIC CENTRES IN FRANCE.

The highly philosophical work entitled "*La Laine*," being one of a series of studies upon the régime of manufactures, by Louis Reybaud, member of the Institute, accompanied by numerous statistical documents, published in 1867, together with the treatise on the industry of card-wool, by M. Randonig, and the more elaborate treatise upon the industry of combed wool, by M. Benoville, published in 1854, furnish reliable data for special descriptions of the most important centres of the woollen

industry in France. The former work is the principal authority for the statements which follow.

ELBEUF.

In the woollen industry Normandy stands in the first rank among the present provinces of France. The genius and taste of the Norman race are the inheritance of a remote antiquity. The country of Caux and the valley of Ange were renowned for their fabrics during the period of the Roman empire, and furnished plaid cloths, woven in squares, the original types of the Scotch tartans, for clothing the Roman armies. There are traces of this industry at Elbeuf in the seventh century, and of considerable activity in the 13th. The industry was arrested by the English invasion of the 14th century, and the inaction was prolonged by the wars of the Fronde. In the 17th century the manufacture of cloth was revived through privileges obtained from the founder of the French protective system, Colbert, and became established upon their present firm foundation through the industrial war which Napoleon waged against England by means of the continental blockade. It is not strange, therefore, to find at Elbeuf one of the most characteristic centres of the woollen industry in the world. The whole life of Elbeuf is its card-wool manufacture, which supports a population of 19,000, and, including that which is floating, a population of 30,000, and furnishes a product of 85,000,000 francs. Elbeuf ranks first of all towns in this manufacture in the fabrication of novelties or fancy fabrics of clothing wool. Other towns can rival it in the strength of goods and cheapness of price, but in everything requiring ornament, delicacy of tints, taste, and elegance in card-wool fabrics Elbeuf stands above all rivals. It is the point above all others where the American manufacturers and designers can acquire that taste which is unattainable without the study of models. The customers of Elbeuf are the principal tailors and great commission-houses of Paris, and they are usually the judges who determine whether a novelty shall be a success. Cases are mentioned where a manufacturer has distributed 40,000 francs' worth of patterns of a single fabric into the hands of commercial travellers, thus sowing that he may reap. The harvest is sometimes enormous. The cases are not infrequent where a happy chance, or a fugitive fancy, has founded a fortune. In the competition of novelties, none of which last more than a season, but which establish modes which extend like the wave of a tide all over the world of fashion, the tide being at its height in a distant province when it has ebbed at its source, there is a novelty and activity which impresses itself upon the physiognomy of the inhabitants of the town.

In the manufacture of novelties and fancy stuffs the designers perform a very important part; for the success of a season depends upon their inspiration. A good designer makes his own terms, and the manufacturers usually secure their services by large rewards. In many cases they have an interest in the sale of their designs, and sometimes become

partners in houses whose fortunes are made by their taste. The design of a fabric is not difficult, and requires no great preparatory study, as it is only necessary to combine some hues and colors to produce a certain harmony of effects. It is a work which it would seem any one could do, and yet it requires a peculiar gift. There is a precise point which the designer must reach, and not overstep; a shade which will be accepted when no other would find favor; a contrast which will be agreeable on one stuff and displease on another; and a management of mere nothings, or little accidents, which appear to have no signification, but which make success or failure. The French designer is restrained by the public sentiment of his country, to which he must never do violence, which requires elegance without affectation, and, in the midst of perpetual caprices, demands what is natural in everything that is original.

Next to the designers rank the workmen, who act as their interpreters, by translating the design upon the loom or the Jacquard cards, and arrange the warps and harnesses so that the weaver may perform the mechanical work. These workmen are all highly paid. Another class of workmen are the *echantilleurs*, or men who execute the first specimen pattern, by which the probable effect of a design is determined. These men are required to be absolutely trustworthy, especially when many specimen patterns are made to secure orders for goods. Some of the large establishments keep their workmen of this class in the utmost seclusion. There are some establishments which make the furnishing of specimen patterns for the smaller establishments their sole business.

There is one peculiar feature in the woollen industry of Elbeuf which has greatly stimulated its extension. It is the facilities for credit which are afforded to the manufacturer. Cost of capital is the obstacle of all others against which the woollen manufacturer has chiefly to contend, on account of the dearness of raw material. Usually the wool manufacturer obtains his raw material only for cash, or on short credit. At Elbeuf there are several houses which are at the same time banks and warehouses, and which give credit for all operations of trade; but the peculiarity of these houses at Elbeuf is that they sell the raw material not for notes payable at a fixed time, but on an account current. Any manufacturer who wants a lot of wool can select it, fix his price, and carry it away. The payment is almost discretionary with the purchaser. Every facility is given for payment, which may be made from time to time, as the manufacturer gets his returns. The account-current is the mirror in which the manufacturer has reflected the state of his affairs. This system, under which personal character is the gauge of solvency, has given great vitality to the business of Elbeuf. Alongside of the hereditary houses of this ancient town there are great numbers of children of their works, who, rising from workmen to overseers, have finally exchanged their chevrons for epaulettes. It is this infusion of new blood which preserves the characteristic vitality and freshness of the woollen industry of Elbeuf. It is unnecessary to say how desirable it is that this system should be imitated

here. It offers a means of improving the condition of the workmen certainly not less practical than the system of co-operation which is now being so earnestly recommended to public favor, but which does not seem of easy application in the textile industry.

A characteristic feature in the manufacturing system of Elbeuf is that while there are many complete establishments where wool enters in the fleece and issues in finished fabrics, the dominant industry of this town is the application of distinct processes of manufacture, single establishments being devoted wholly to preparing wool, others to carding, or spinning, or dyeing. Each of the processes of washing the wool, drying, burring, carding, supplying patterns, weaving, spinning, fulling, gigging, pressing, and packing, constitute separate industries. There are 20 great dyeing establishments, 12 for spinning, 50 for working up waste, many drying establishments, &c., and many houses which are commercial rather than industrial, uniting these different industries to produce fabrics which they put in the market. This system is very advantageous to the small fabricant who has but little capital at command. He can choose for each kind of operation the special establishment where it is done best, and at the least expense. The advantages are so marked that many wealthy houses avail themselves of it. It is well worthy of consideration whether this system could not be advantageously introduced in some of the great manufacturing centres in this country. It prevails here to a limited extent, as for spinning yarns. It has recently been applied to washing and preparing wool. It may be found, as has been the experience at Elbeuf, that where both systems, that of concentration and dispersion of labor, prevail, it is advantageous to the general advancement of the manufacturing industry.

All the regions where the woollen industry is pursued in France have a comparatively improved aspect, showing the increase of wealth which manufactures have added to the national resources of the soil. The cottages with only a single room are less frequent, and here and there may be seen the dwelling of a workman indicating a comfort and decency of living which is rare among the peasantry of France. Yet the condition of the common workmen at Elbeuf, judged by the American standard, is far from being easy or enviable. The whole number working within and without the town is estimated at 24,000.

The following statement of their average wages is derived from statistical documents prepared since 1864 by a former mayor and president of the Chamber of Commerce of Elbeuf:

For children, limited to 8 hours' work, 75 centimes to 1 franc 10 centimes, (equal to 15 cents to 22 cents;) for those working 12 hours, 1 franc 25 centimes to 1 franc 50 centimes, (equal to 25 cents to 30 cents;) youths from 16 to 18 years old, 1 franc 50 centimes, (equal to 30 cents;) workmen by the day, 2 francs to 3 francs, (equal to 40 cents to 60 cents;) men working by the task or piece, 3 francs to 4 francs 50 centimes, (equal to 60 cents to 90 cents)—these are more numerous than the day workmen;

workmen working by the day, 1 franc 10 centimes to 2 francs, (equal to 22 cents to 40 cents;) women working by the piece, 1 franc 75 centimes to 2 francs 50 centimes, (equal to 35 cents to 50 cents.) It is estimated by M. Reybaud that in the most ordinary cases the yearly wages for men are 750 francs, (\$150;) for women, 525 francs, (\$105;) for young men and girls, 375 francs, (\$75;) for children, 225 francs, (\$45.)

The prices of food and lodging are relatively high at Elbeuf. Meat costs 1 franc 60 centimes the kilogram, (or 17 cents per pound,) and potatoes 5 to 6 francs the bushel. The food of the men, such only as serves merely to support life, costs per year 350 francs, (\$70;) house rent, 125 francs, (\$25;) other necessary expenses for maintenance, 160 to 180 francs, (\$32 to \$36.) On this scale of living the workman is able to eat meat only on Sunday, the only animal food on weekdays being salt-herring or mackerel; and even with this meagre sustenance there is hardly any margin for saving or amusement. The invariable consequence of the reduction of the compensation of labor to the bare necessities of life, the system which free trade demands to have applied in this country, is shown at Elbeuf in the moral degradation of the working classes. The consumption of alcohol at the drinking shops is, for the whole population of the town, 16 litres (28 pints) per head, or, deducting the women and the children, 50 to 60 litres (from 80 to 100 pints) for the average consumption of the frequenters of the cabaret. "On the other hand," says M. Reybaud, "the women give themselves up to other tastes. Their toilettes consume their savings, and their scruples are not in general very vivid as to the means of increasing the same when it is insufficient." One proof of the general looseness of morals among the whole people is the custom which prevails among men and women to resort for the night's lodging to vast dormitories, where both sexes are mingled in a common, unlighted apartment, without partitions, and wholly free from surveillance or restraint. Another evidence of the low morality of the workmen is the common practice among the hand weavers to sequester a portion of the yarn delivered to them to be woven. It is estimated that some workmen by this means add a quarter to a third to their stipulated pay. It is thus that labor revenges itself for insufficient wages.

In looking at the woollen industry at this important centre, as a whole, we find this industry, viewed merely as an art, in the highest state of perfection, and presenting in taste and processes everything worthy of imitation; but, while art thrives, and employers are enriched, labor is degraded, morality is depressed, and humanity suffers. When we see the benevolent men of France candidly publishing such facts as are stated above, and acknowledging and deploring the evils of the social system inherited from the old feudalism of Europe, shall we not submit to the slight sacrifice demanded to reconcile, in this country, what Europe has failed to do—progress in the industrial arts, with a just compensation to labor?

SEDAN.

The woollen industry of Sedan, although of the same general character as that which flourishes with greater prosperity at Elbeuf, deserves special notice from the celebrity of its products. The manufacture of cloths was pursued by isolated workmen from Flanders, when Colbert applied his vast energies to give a national character to the manufactures of France. He gave to Abbeville, Van Robais, a legacy chronicled by Thiers as more valuable to France than the conquests of Louis XVI, which struck down the Spanish power, and to Sedan, Nicholas Cadeau, a master in his art, who soon converted the modest production of the hamlets into an urban manufacture. Establishments for dyeing, carding, and dressing were brought within the walls and became protected by the cannon of the citadel. That which, above all, promoted the success of the manufactures of this city after their first establishment, was the fidelity with which its cloths were fabricated; the marks of its fabrics were, like the marks on Swedish iron, or the tower mark on English silver, infallible seals of excellence. The black and blue cloths preserved their reputation from generation to generation, and many houses of Sedan are still faithful to the ancient traditions, as proved by one gold medal and eight silver medals, and none of less degree, awarded at the Exposition.

It is singular that an invention originating in Sedan should have changed the ancient system which made excellence in material and fabrication the essential qualities of cloths. This invention was that of the modern styles of fancy cloths, and was due to one of those happy chances which often lead to great results when improved by intelligence. M. Bonjean, an educated manufacturer, one day found among his products a piece of goods which was defective in body on account of the dead wool of which it was fabricated. It occurred to him that he could give body to the wool by incorporating some fibres of silk in the warp. Upon combining the wool with the silk he found that the latter was not incorporated in the fabric, but made a distinct design upon the cloth. Improving upon the idea here suggested by using the Jacquard loom, he finished a fabric and sent it to a leading tailor at Paris. To his astonishment he had an immediate order for more goods of the same styles; still more variety was given to the fabrics, and the stuffs received the name of the Bonjean patterns. This was the origin of the fancy cassimeres, and other stuffs, which now comprise three-quarters of the production of card-wool goods, but which, unhappily for Sedan, built up the city of Elbeuf, the most formidable of its rivals.

Leaving the consideration of the technical for that of the social aspects of the industry at Sedan, we are interested in observing the superior morality of the workmen of this city, which is partly attributed to a smaller population, as compared to other manufacturing cities of France, but mainly to most honorable efforts on the part of the manufacturing employers.

The increased use of strong alcoholic drinks in consequence of the dearness of the wines, has caused drunkenness to become a prevailing evil among the manufacturing population of France. "For the first time in the course of my travels," says Mr. Reybaud, "I have found at Sedan a population which was able to defend itself against drunkenness. The first honor is due to the chief of the manufacturing houses. By a concert which should be taken for an example, they have closed the doors of their ateliers against workmen with whom this vice was notorious, who themselves consent to this exclusion. The strife has been a long one, and with any other population, perhaps, the reform would not have succeeded. At Sedan it has had full success: acting first upon those less hardened, it has ended by reclaiming or improving the most obdurate. Towards those who, with the best intentions, would occasionally yield to temptation, they have shown indulgence, admitting them to the benefit of successive amendments; provided it was recognized that the cases were less frequent and less grave, their presence in the mill was tolerated. The condition was that they should make a sincere confession, or that the wife, the party so deeply interested, should ask favor for the husband's delinquency. The results of this reform are exhibited by the statement given of the habits of the workmen of Sedan by a former member of the assembly: 'The working population are very regular. The life in the family is the rule. The religious sentiment prevails in the mass and manifests itself in acts. The workmen do not frequent the cabaret on Sunday. They pass the day with their wives and children in the little garden which is the object of their ambition. Education is spreading every day; a man of 30 years who cannot read and write is a rare exception.'" The economy produced by these habits, and cheapness of food and lodging, enable the workmen to sustain themselves upon the small wages; which are, for spinners working by the piece, from 3 francs to 5 francs 50 centimes (60 cents to \$1 10) per day of 12 hours. The women, spinning by the piece, earn 1 franc 50 centimes (30 cents) per day. The weavers, working by the piece, can earn 4 francs (80 cents) per day. The ordinary workmen receive 20 centimes (4 cents) per hour, or 2 francs 40 centimes (48 cents) per day. The women average 1 franc 20 centimes, (24 cents,) and children 75 centimes (15 cents) per day. The absolutely necessary expenses of living of a single workman earning 750 francs (\$150) a year are stated at 661 francs, (\$132 20;) being for food and lodging, 531 francs, (\$106 20;) tobacco, 20 francs, (\$4;) washing and general expenses, clothing, &c., 100 francs, (\$20;) leaving the pittance of 89 francs (\$17 80) for luxuries and savings. It is supposed in the above estimate that the workman, as is the usual practice, eats animal food once a day.

REGION DU MIDI.

The region of the middle of France comprises the third important centre of the card-wool industry of that country, but contrasting strongly

in its character with that of the districts before described. Its principal points are Lodève, Mazamet, and Bedarieux, while there are many less important localities. The common character of the production of this group, Mazamet only being excepted, is its adaptation to popular consumption. The foundation of the manufacture consists in the fabrication of strong cloths for workmen and army use, recommending themselves rather by their serviceableness than their appearance. A noticeable feature of the woollen industry of this group is, that the goods for common use are not trashy imitations of showy fabrics, but pretend to be no more than they are, common but serviceable goods. The manufacturers of this group supply nearly all the cloths consumed in the French army. The government demands only two conditions, a moderate price and faithfulness in execution. The rigid requirements of the government cause the most severe scrutiny on the part of the manufacturer, and have cultivated honesty of fabrication among the workmen. The absolute reliability with respect to these fabrics has opened a very important trade in cloths with the stationary people of the east, this trade having been established some generations ago.

Bedarieux, with a population of 9,000 souls, has 5,000 woollen workmen and as many more in the environs. The goods are manufactured principally with reference to exportation; through the means of commercial houses at Marseilles it sends its products to the markets of the Levant, or the French possessions in Africa and often to India. In this trade certain conditions have to be scrupulously observed to maintain the honor of the marks upon the cloths and guard the confidence of the eastern customers. For example: for the Levant there are required two sorts of cloths, the stamboul, which is a heavy cloth, and the mahout, which is a light cloth. The weight of the stuff must correspond exactly to the denomination assigned to it. For the army cloths 40 kilograms of wool give regularly 43 metres of stuff. For the cloths destined for the Levant the proportions are lowered. The stamboul, which is used for cloaks, requires only 44 kilograms of wool for 50 metres of cloth. The mahout requires 37 kilograms of wool for 60 metres of stuff, the price and quality decreasing in the ratio of the quantity of material employed. In the east the stuffs are both measured and weighed, and the goods are not received unless the measure and weight conform. With the fixed habits of the east the consumption of these goods is constant and regular. Here is a case where an important trade supplying all the armies of France, and an immense and increasing population at the east, has been established for generations mainly upon the commercial honor of the manufacturer. Our former trade with the east in brown drillings is a similar example.

The manufacturers of this group are not wholly limited to the specialties above mentioned. Bedarieux has almost the monopoly of cloth for caps, of which it sends forth, principally to Paris, 250,000 pieces a year. Mazamet, a town in this group, through the enterprise of a single manu-

facturer, M. Houles, has risen in half a century from an obscure hamlet to a town of 12,000 inhabitants, of which there are 5,000 workmen, while there are as many more in the environs. Mazamet has entered into competition with Elbeuf in articles of novelty; its products, which now reach a value of 14,000,000 of francs, have made their way into the market of Paris and even of London.

A pleasing feature in the industry at Mazamet is the establishment of special workrooms for workwomen with nursing infants. Ordinarily the workwomen are prevented by their confinement in the mills from nursing their young children, as the women cannot leave the mill without losing their places. They ordinarily relieve themselves from this care by intrusting their infants to hired nurses. This is both a privation and an expense, the latter being equal to half the wages of the woman. At Mazamet a special workroom is provided for mothers with nursing children. The women are employed in very simple work, such as the sorting of wool or winding yarn upon bobbins, and can continue their labor while exercising their maternal duties. All access to this workshop nursery is prohibited to other workmen. The wages of the women are reduced in proportion to their labor, but all things considered, they gain greatly by this arrangement. It is refreshing, amidst the indifference to the condition of the laborer so prevalent in Europe, to see in an industrial experiment the expression, in this touching form, of a sentiment of humanity.

Within this group there is one establishment quite remarkable for the original manner in which it has been sought to combine industrial prosperity with the social amelioration of the workmen. The establishment of Villeneuveville bears the title of a royal manufacture, it being one of those founded by Colbert. Although under private proprietorship, it is exclusively devoted to the fabrication of cloths for the army. It preserves in many respects the features of a military post. It is surmounted by battlemented walls, the drum beats the reveille and tattoo, and the drawbridge is raised at night. The whole town is under the proprietorship of the establishment, and residence is permitted to no stranger who refuses to conform to the usages of the place. The mayor and officers of the municipality are workmen, elected by the workmen themselves, and there have been but four mayors since the time of the first empire. The workmen submit cheerfully to the military discipline which they have imposed themselves. The proprietors pay the best wages in the district; they contribute to the schools, at which attendance is compulsory, and to the common fund for the relief of the sick and aged, and provide flour and fuel at cost prices. Games of chance are prohibited; drunkenness is punished by exclusion. There is but a single cabaret, which is closed at 9 o'clock. In the course of 30 years there has been but one illegitimate birth. The people of this community have invariably kept aloof from political agitations; and when, in revolutionary times, bands of workmen of the surrounding country have scoured it

in arms, the workmen of Villeneuveville have excluded access by raising their drawbridge and manning their ramparts.

The average wages for labor in this group are less even than in the districts of Elbeuf and Sedan. The average day's wages are stated to be, for men, 2 francs 25 centimes, (45 cents;) for women, 1 franc 25 centimes, (25 cents;) and for children, 50 centimes, (10 cents.) This would give to a family of a man and wife with two children, all at work, 1,350 francs (\$270) per year. It is estimated that the food per head costs, for a man, 75 centimes, (15 cents;) for a woman, 65 centimes, (13 cents;) and for a child, 50 centimes, (10 cents.) This for a family, as above, would be an expense of about 900 francs, (\$180.) To this is to be added lodging, 100 francs, (\$20;) clothing and other necessary expenses, 250 francs, (\$50,) making a total expense of 1,250 francs, (\$250;) and leaving a nominal surplus of 100 francs, (\$20.) These receipts are possible only when all the family are at work. Thus, under the most favorable circumstances and without accident or sickness, all that a family of four persons can hope to secure for saving or luxuries is \$20 a year.

RHEIMS.

We come now to the great centres of the combing-wool industry of France, far surpassing in importance that of card wool, already passed in review. To the agriculturist and the manufacturer, the city of Rheims—the most ancient seat of the Roman Catholic faith and of some of its most splendid monuments of architecture—is more interesting as the seat of a complete revolution in a great branch of textile industry, effected through the introduction of an improved race of ovine animals. The fabrics of combed wool, for which Rheims was so celebrated in ages past, the says, serges, and tanimins have wholly disappeared since the Spanish blood has been introduced into the sheepfolds of Champagne.

In 1801 an obscure workman of this city, named Dauphinot Palloteau, first made from the soft and long wool of the Rambouillet sheep the most unrivalled of modern woollen textures—the French merino—which, from its softness and solidity, must always hold its place independently of the caprices of fashion. The manufacture was extended through the influence of the Baron Ternaux, the most celebrated of all the manufacturers of France of his time, who founded at Rheims one of his many manufactories.

This fabrication of merinos constitutes at present the most important part of industry at Rheims, no cotton-warp fabrics being made, as at Roubaix. In 1786 the product of stuffs in this city was 94,615 pieces, of a value of 11,000,000 francs, employing 30,000 workmen and 12,000 looms.

In 1863 the value of fabrics produced was 80,000,000 francs. The number of hand looms employed was 19,000, occupying 38,000 workmen, and the number of power looms 1,300, occupying 900 workmen. For combing the wool there were 340 machines; for carding, 350 sets of machines, employing 5,000 workmen; and for spinning, 170,000 spindles,

with 2,400 workmen. The number of workmen in full activity was 55,000. The 30,000 workmen in 1786 produced a value of 377 francs per head. The 55,000 workmen in 1863 produced a value of 1,454 francs per head.

The most important change in the manipulation of this industry has been in the combing of wool. This was formerly effected by handicraft workmen, employed at their own homes. No labor in the woollen industry was so poorly paid, and the misery of the hand combers was proverbial. Their irregular wages did not exceed $1\frac{1}{2}$ franc (30 cents) per day. Still the strife between the first imperfect machines and the hand combers was long and severe. The latter did not succumb until their wages were reduced to 80 centimes (16 cents) per day. Longer resistance was vain; the best workman could comb only 350 kilograms of wool per year, and a machine combs 20,000 kilograms. Of 10,000 hand combers at Rheims not one remains. For thirty years the genius of inventors has been applied to the perfection of combing machines. More than twenty inventions have added improvements in details. At Rheims there are at present in use three principal processes, that of Lister, of Heilman, and of Hubner; each of analogous merit, and each having its partisans. M. Holden has become the proprietor of all the principal processes or patent-rights, in addition to his own, holding 45 patents; 17 of his own and 18 by assignment. He thus nearly controls the combing of wool in France. He has put in operation three combing establishments at Rheims, St. Denis, and at Croix, near Roubaix. He is able to comb 16,000 kilograms a day. He employs 1,300 workmen, engines of 1,000-horse power, and 80 combing machines. There are no other establishments in Europe having these proportions, and so well able to resist competition.

For many years it was deemed impossible to weave merinos advantageously by power looms. Mechanical weaving is now accomplished with a perfection which leaves nothing to desire. A hand weaver can make 24 throws of the shuttle a day; the weaver on the power loom makes from 50 to 55 throws, and can easily tend two looms, so that his product is four times as much as the hand weaver's. There is, besides, more regularity in the product and less loss of material. The power loom is worked without muscular effort, hardly anything more being required than a little dexterity in mending the broken yarns. Women can do this work better than men, and in many establishments at Rheims women are exclusively employed under overseers. The superior advantages of the power loom open a sad prospect to the hand weavers of Rheims, of whom there are 38,000; and the means of averting the suffering from this class of workmen, in the inevitable change which must take place in the procedure of weaving, is a subject of most anxious consideration to the benevolent men of Rheims.

The precarious condition of so large a class of the workmen, and the gradual diminution of their wages, create a discontent which is ominous

of public calamities. The incendiaries of 1848 inflamed the workmen to such an extent, they destroyed the first establishment provided with power looms, and they look with an evil eye upon every one who introduces the new machines. It is admitted by the authorities of Rheims that an envious hatred of the rich prevails always among these workmen, and if they are tranquil at present, it is because they are "kept down by a strong government."

The manufacturers of Rheims regard the United States as the most important outlet for their goods. Our late war seriously affected their trade. They speak of the American crisis as having weighed so heavily upon it that the influence of the Anglo-French treaty upon commercial transactions was of comparatively little moment. The value of this trade is a sufficient inducement for us to transfer to our own shores the industry of fabricating merinos, which is dominant at Rheims. It can be adopted here with all its recent perfections, and without any of the drawbacks which weigh so heavily upon it in France. It is fitted for the skilled female labor already developed in our woollen mills. It will be favored by the character of the wools most advantageously grown here, and will greatly increase the production of sheep husbandry by creating an entirely new demand, and will introduce into more general use the softest and most beautiful of all fabrics for female use.

The effects of the struggle between the old and new system of manufacture is seen in the low average rate of wages in this city. The workmen employed upon power machines are comparatively well paid. The men spinning combed wool are paid from 3 francs 50 centimes (70 cents) to 4 francs (80 cents) per day, and the women from 1 franc 40 centimes (28 cents) to 1 franc 70 centimes, (34 cents.) The power-loom weavers earn from 2 francs 25 centimes (45 cents) to 3 francs (60 cents) per day, but the hand weavers, who compose the greater part of the working population, are reduced to wages which average only, for a man, 1 franc 50 centimes (30 cents) a day, for a woman 1 franc, (20 cents,) and for two children 75 centimes, (15 cents,) a total of 1,200 francs (\$240) a year, for a family of four persons. The estimated expenses for the absolute necessities of living are 1,188 francs, (\$237 60,) leaving a surplus above bare necessities of only 12 francs, or a little over two dollars. It is hardly necessary to say that this surplus is scarcely ever attained, and that poverty, debt, and moral degradation are the normal conditions of this industrial population.

CATEAU,

in the region of the north, furnishes an example of what may be done in the industry of merinos by adapting on a large scale the most recent processes, and making use of a raw material supplied from domestic sources. In 1818, M. Paturle selected the locality of the small town of Cateau, having a stream of water, affording a moderate hydraulic power and a laborious and intelligent population, already skilled in the

domestic manipulation of wool, as a site for the development of the idea of deriving the greatest possible benefit from the soft wool of the Spanish race, then commencing to abound in that region. He conceived that the utmost development of which the fibre of the new race was susceptible was in the fabrication of merinos, recently introduced at Rheims. From this idea there sprung up in the hands of MM. Paturle & Lupin, and of their successors, the most extensive manufactory of merinos in France, and the one which would serve best for a model in this country. The original machinery comprised only some instruments for combing and spinning, the weaving being operated on the hand-loom of the adjoining country. In the course of 30 years the machinery has been entirely renewed. The old water-wheels have made way for steam engines of 250 horse power, moving 60 combers, 40,000 spindles, and 600 power-loom. 2,000 workmen are employed directly in the mill, and the hand-weavers of the country furnish 4,000 auxiliaries, making a total of 6,000 workmen. The freight transported to and from the establishment amounts to 5,000 tons, and the value of the production is from 18 to 20 million francs, three-quarters of which is exported to all quarters of the world. The proprietors have earned their splendid prosperity by being faithful to the fabric first adopted. They have attained the utmost perfection in processes of manufacture by the employment of machines whose serviceableness had been verified, and have made their goods salable by a moderation of price without the sacrifice of quality. The Bradford delegates who visited Cateau, at the time of the Exposition, were "struck with astonishment at the cleanliness, order, and regularity of the vast establishment." Admirable schools are provided for children and adults attached to the works, and a public laundry and baths. The widow of the founder of the works has constructed and endowed a hospital provided with twenty beds for invalid workmen, as a monument for her husband. These foundations show that the generous sentiments of the proprietors have been among the elements of their prosperity. The best workmen earn at this establishment, where their condition is probably more favorable than anywhere else in France, from 3 francs 50 centimes (70 cents) to 4 francs (80 cents) per day, and the women at the power-loom from 1 franc 60 centimes (32 cents) to 2 francs, (40 cents.) It is estimated that with strict economy the head of a family can save from 60 to 150 francs, but, as has been said with regard to all such calculations, "we must distinguish that which is possible from that which is."

There are many other important centres and special localities of this industry which might be studied with profit, as that of the fabrication of merino shawls, or imitations of the Cashmere, distributed in the agricultural villages of the north in the arrondissements of Cambrai and Avesnes, and conducted under the direction of large houses in Paris; the spinning establishments of Fournies, where a mere hamlet has grown into a town of 4,000 inhabitants, employing 30,000 spindles, through the

co-operative association of workmen, the most signal example of the success of co-operative industry in France; the characteristic manufactures of Amiens, which produce annually more than 20,000,000 francs in value of the various fabrics from the hair of the Angora goat; but the space allotted in this paper for the manufactures of France must be reserved for the most important centre of the combing wool industry.

ROUBAIX.

Of all the manufacturing towns in France there is no one which in activity, enterprise, and rapidity of growth, compares with Roubaix, the "Bradford" of the empire. Situated upon the borders of French Flanders, its industry is a direct inheritance from the Flemish artisans, who in the middle ages were masters of the woollen industry of the world, and who supplied what Fuller calls that "treasury of foreigners" who enriched England by the introduction of the Flemish arts. A mere rural hamlet of two hundred families in 1469, overshadowed by the powerful town of Lisle, it was authorized by patent from Charles, Duke of Burgundy, to fabricate a limited class of woollen stuffs. Its powerful neighbor, Lisle, disputed this right, which was finally confirmed by the Emperor. Still, for three centuries an industrial war was carried on between the rival towns, which contributed greatly to the hardihood and enterprise of the victor, which Roubaix has finally become. The treaty of Aix-la-Chapelle in 1668, which united Flanders to France, by opening a larger market, gave a broader field to Flemish activity. The production of stuffs at Roubaix, which in 1612 was about 3,000 pieces, regularly increased until 1771, when the production was 38,000 pieces, occupying 40,500 laborers of both sexes, and representing a value of 2,987,500 francs. In 1786 the manufactures of Roubaix were sufficiently important to induce her to take the lead in resisting the consequences of the disastrous treaty of the Marquis de Vergennes, which admitted English goods into the French markets at nominal duties. All its inhabitants, men, women, and children, signed an act by which they bound themselves to wear nothing but the stuffs of France. This movement was followed in all the provinces, and the engagement was kept until the policy of 1786 was repealed and protection restored. True to her traditions, Roubaix, of all the cities of France, is most earnest in denunciation of the relaxation of the protective policy through the recent treaty with England. Within the present year, as appears by the *Journal des Economistes*, the consultative chambers of arts and manufactures of this and the adjoining city of Tourcoing have protested to the minister of commerce against the renewal of this treaty, declaring that the public fortune of Roubaix has suffered by the treaty to the extent of 200,000,000 of francs. The workmen of Roubaix have petitioned the Emperor to the same effect. The manufacturers of Lisle and Amiens have followed this movement, which is supported by the *Moniteur Industriel* of January 9, 1868, as follows: "15,000,000,000 this Anglo-

French alliance has cost us. Counting the results of the Belgium treaty, and of that which we have concluded with the Zollverein, and we have a total of 20,000,000. The treaties of commerce, the grand economical reform, the works which render illustrious the second half of the 19th century, have carried 20,000,000 to the debtor side of our national balance sheet."

The ancient device upon the municipal coat of arms of Roubaix embodies in two words the secret of all prosperity in manufactures as well as in common life, *Industrie et Probité*. Among the masters in textile industry in former times, a faithful fabrication of their stuffs was a point of honor as cherished as bravery in knights and virtue in women. The fabricants of Roubaix resisted the license in the fabrication of stuffs which was permitted after the revolution. They insisted that the ancient municipal regulations established to prevent frauds in manufacture should be preserved, and for forty years, through their chamber of commerce and council of Prudhommes, demanded of the government the restoration of the ancient restrictive regulations.

No city has derived a greater advantage from the freedom which it so earnestly resisted. For the last half century, the industrial life at Roubaix has been only one series of enterprises and happy experiments. Its dominant idea has been to adapt fabrics of luxury to popular consumption by combining the best taste and highest excellence with the lowest possible price. With this idea it has continually varied its materials and styles, combining wool with cotton, with silk, with mohair and flax, but in all the economies of production preserving a grace of decoration and sobriety and harmony of colors which takes from cheapness all its vulgarity. The Anglo-French treaty has compelled Roubaix to enter into direct competition with Bradford in the production of the light and fragile mixtures of wool or goats' hair with cotton warp, such as the bareges, the coburgs and mohairs, which have given such an immense development to the English worsted industry; but it appears, from the recent statements of its manufacturers, that its superior taste and invention have not enabled it to retain the control of the domestic market in conflict with the more powerful capital of England. The great establishments sustain comparison with their English rivals, whose methods, dimensions and machines they have adopted. The rapidity with which the town has advanced is without parallel in France. From a population of 5,000 souls in 1786, it has gone progressively to 10,000 in 1806, 15,000 in 1830, 25,000 in 1840, until it reached 55,000 in 1864, while its production of fabrics has risen from 3,000 to over 400,000 pieces, and the annual value of its manufactures has been increased from 3,000,000 or 4,000,000 to about 200,000,000 francs. This rapid growth is rivalled in Europe only at Bradford, which has been built up by a similar industry. It is remarkable that this marvellous prosperity is due in no respect to any advantages of nature or location. Roubaix had no water power, its natural streams being insufficient to supply the bleacheries;

and even in 1824, its only approach to Lisle was by a road impracticable in winter; the original source of its power was its native population, which had inherited the skill, arts, and enterprise of its Flemish ancestry. The ultimate source of this prosperity has been the happy idea of applying the native skill and taste, aided by the modern powers of steam and machinery, to furnishing in the cheapest and most attractive form the light fabrics for the largest and most important class of consumers, the women and children, and in satisfying the fickleness of female taste by constant variations of textures, styles and colors. The secret of the profitableness of this manufacture is, that the utmost amount of mere machine labor is given to the smallest possible amount of raw material. Sales and estimates of tariff duties in card-wool fabrics are made in a great measure by weight, having reference to the quantity of raw material. In combing-wool fabrics they are made by the yard. It is estimated that a single hoggett fleece from a Lincoln sheep weighing 20 pounds of a length of staple of 17 inches, such as has been sometimes exhibited in England, when used in manufacture to its utmost extent, with cotton, to fabricate the finest alpaca fabrics would suffice to make 16 pieces, or 672 yards, enough for 56 dresses. The same amount of wool made into cloth would not make suits for six men.

M. Benoville states that a careful calculation made at Roubaix in 1843 showed that there were consumed at that place in the manufacture of the class of fabrics in question, 4,536,168 kilograms of wool, of the value of 17,000,000 francs, averaging 3 francs 74 centimes the kilogram. There were consumed, besides, 1,225,000 francs in value of silk and cotton, making the total raw material consumed 18,285,000 francs. The total production of fabrics of this district was valued at 63,000,000 francs. The goods put in consumption, then, had a value three and a quarter times more than that of the raw materials consumed; that is, 3 francs 74 centimes for the raw wool, &c., and 9 francs 35 centimes for the manipulation, cost of capital, and profit.

But it is unnecessary to speculate upon the reasons of the remarkable development during the last half century of the class of manufactures under consideration. Roubaix and Bradford are in themselves enough to demonstrate that the combing wool industry, which, comparatively speaking, we have hardly touched, is for this country the most encouraging field for labor in the whole range of the textile industry.

It remains, pursuing the course adopted with regard to the other great centres, to consider the condition of the industrial population at Roubaix.

The average wages per day actually received, deducting the time actually lost, are stated as follows by the statistical authorities:

Combers of wool: men, 2 francs 60 centimes, (52 cents;) women, 1 franc 80 centimes, (36 cents.) Spinners: men, 2 francs 60 centimes, (52 cents;) women, 1 franc 80 centimes. Weavers: jacquard, 2 francs 25 centimes, (45 cents;) power loom, 2 francs 25 centimes,. Dyers: 2 francs 60 centimes, (52 cents.)

It is estimated that the strict expenses for a household of five persons, the father and mother only receiving wages, are 2 francs 70 centimes (54 cents) per day; being 40 centimes (8 cents) for lodging, 1 franc 10 centimes (22 cents) for bread, 75 centimes (15 cents) for other aliments, and 45 centimes (9 cents) for washing, fire and light. In this calculation meat is not included, it being only occasionally used by the workmen. The total cost for the above items per year is between 986 and 1,000 francs. Estimating that the cost of supporting the family falls upon the father and mother, on the average conditions, their united wages are from 1,150 francs to 1,250 francs a year, being an excess above expense in the first case of 150 francs, and in the second of 250 francs. But in the above calculation neither clothing nor furniture are included, and absence from animal food is a condition of the estimate. Where family life must necessarily be so hard and austere, and having scarcely any enjoyment except that derived from performance of duty, we are not surprised to find among the statistics of a city provided even with schools and religious institutions, that in the year 1863, of a population of 54,000 there were but 487 marriages, and that there were 283 illegitimate births, of which 265 were not acknowledged.

It is due to the French social writers and statisticians to say that the facts illustrative of the condition of the laborers are stated without any attempt to justify them on the one hand, or to exaggerate them on the other. It would appear that the evils of the European rule of the compensation of labor are so vast and so entwined with the existing social and political system, that it is vain to attempt to grapple with them. "The question of wages," says one writer, "is one of the most important questions of our epoch, and perhaps the most difficult to resolve; we shall not attempt to discuss it." Another writer says: "Before long this question of wages will occupy a more important part than it has done before in the respective accounts and means of defence of the various industries." It is hoped that for this country, at least, the question of wages is solved by adopting the system of protection, not of manufactures, but of labor, "as the means of defence of our various industries."

OTHER EUROPEAN NATIONS.

BELGIUM, GERMANY AND AUSTRIA.

The other principal centres of the woollen industry upon the continent of Europe can be passed in review but briefly. In Belgium, the principal seat of the card-wool industry is at Verviers. This city, a century ago a town of 5,000 souls, has acquired through its woollen manufactures a population of 28,000, and with that of its suburbs of 40,000. In 1797 its production amounted to the value of three or four millions of francs. In 1864 the production was valued at 70,000,000 francs, its annual increase being at the rate of 10,000 pieces a year. The reputation of some of its manufacturers is nowhere surpassed, as of M. Sim-

monis, whose name stands first among the individuals who were honored by medals in the class of card-wool fabrics at the Paris Exposition. Belgium manufactures principally for foreign consumption, and the United States is one of its largest outlets. It is able to surmount the barriers of our duties, by reducing the wages of its workmen. The day's pay of many weavers does not exceed 1 franc 50 centimes, (30 cents,) and women do not earn more than from 80 centimes (16 cents) to 1 franc, (20 cents.) The average wages at Verviers is 2 francs (40 cents) for twelve hours' work. By means of this cheap labor, stuffs of wool mixed with cotton are produced which cost only from 1 franc (20 cents) to 1 franc 55 centimes (31 cents) the metre. The wear and dye are in proportion to the price. The low wages in Belgium are looked upon with no little alarm by England, and especially by the iron manufacturers.

The woollen manufacture of the Zollverein, that is, Germany without Austria, according to the most recent statements, employs 850,000 spindles, and produces tissues of a value of more than 400,000,000 of francs, of which 50,000,000 are exported. The cloths, especially the fine broad-cloths and doeskins, are largely exported to this country. Competition with England and the surmounting of our duties are rendered easy by still lower wages than prevail in Belgium. The average price for a day's work for weavers in the country does not exceed 1 franc 25 centimes, (25 cents,) and for towns 1 franc 75 centimes, (35 cents.) Women are paid one-third less.

The following facts as to the production and wages at Aix-la-Chapelle, one of the most important centres of the card-wool industry, were obtained from Mr. Vesey, United States consul at that city, by Mr. R. W. Robinson:

“Annual production, 150,000 pieces, of 25 yards to the piece.

“Raw wool principally procured from Berlin, Breslau, London, and Antwerp, in the raw state, 7,500,000 pounds; average cost from 40 to 110 thalers, Prussia, the 110 pounds English—say 27 cents to 70 cents per pound, gold.

“*Wages—10,000 workmen.*

“Men earn from 3 to 5 thalers per week, \$2 25 to \$3 75.

“Women earn from $1\frac{1}{2}$ to 3 thalers per week, \$1 to \$2 25.

“Children earn from $\frac{2}{3}$ to $1\frac{1}{2}$ thaler per week, 50 cents to \$1 $12\frac{1}{2}$.”

Austria works up annually 77,000,000 pounds of wool into tissues which represent a value of \$50,000,000. The town of Brunn, in the heart of the pastoral province of Moravia, is one vast cloth factory, having at command an excellent situation at the confluence of two rivers and upon two lines of railroad, and also employing the best processes and machines. Its really admirable goods have been largely introduced into the United States, the introduction having been aided by a system of invoices in fraud of our tariff, hardly equalled in unscrupulousness elsewhere. The prices of sound cloths are the lowest in Europe, and the average wages do not exceed 1 franc 25 centimes (25 cents) a day.

GREAT BRITAIN.

It is through her wool that England has risen to the first place in the world in the textile industry. Her soil and climate favored the culture of sheep possessing qualities found in no other race or country. The prevailing national sentiment, as expressed in the words of one of its old writers, is that "wool is the flower and strength, the revenue and the blood of England." Its exclusive possession was secured by laws forbidding its exportation, and the acquisition of auxiliary wools from abroad was secured by their admission at small or merely nominal imposts. The woollen manufacturers having acquired the highest arts of the Low Countries and France, from the refugees whom the persecutions of the Duke of Alva and the revocation of the edict of Nantes had driven to the English shores, were "fondled, favored, and cherished," to use the words of Mr. Huskisson, by a persistency of national protection without parallel in the history of industry. The woollen industry was first planted in the eastern and western counties. In the 18th century it changed its seat to the counties of the north, where coal abounded for propelling machinery, and the neighborhood of large flocks of sheep gave the choice of fleeces, and in the West Riding of the county of York it has been developed into gigantic proportions. The most remarkable woollen establishments of the world are concentrated in this district, but distributed in four principal towns, each of which, by a law which seems universal, has devoted itself to a special industry. Leeds, to heavy drapery; Huddersfield, to light drapery; Halifax, to carpets; and Bradford, to thin and brilliant worsted stuffs. The effect of a successful woollen industry upon population is remarkably illustrated in this district. In the West Riding, where there was a population of only 593,000 inhabitants in 1801, it had risen in 1841 to 1,154,000, and in 1867 to 1,375,000. In 1841 it had increased at Halifax from 63,000 to 130,000; at Huddersfield from 14,000 to 38,000; and at Leeds from 53,000 to 152,000. The increase of population is still more remarkable at Bradford, the great seat of the worsted industry. At the commencement of the century, when all the wool was spun and woven in the houses of the workmen, this town had a population of only 13,000 souls; in 1821 it had doubled the number of its inhabitants, which then reached 26,000. By the introduction of power-looms in 1825, the use of cotton warps with yarns of wool in 1834, and the employment of the hair of the alpaca and Angora goat, first used in 1836, the manufacturing industry was so developed that it sustained, in 1851, a population of 103,000, and of 115,000 in 1864, an increase of over 100,000 in half a century. In singular contrast with the infinite variety which Yorkshire now produces, and its industry, which occupies upon a district of 50 square miles 750,000 spindles and 35,000 power-looms, distributed in 932 establishments, employing 75,000 workmen, is the picture left by an ancient statute of the condition of the woollen industry in the city of York, in the time of

Henry VIII. During the reign of this monarch an act was passed in favor of the city of York, reciting and declaring "that the poor of that city were daily employed in spinning, dyeing, carding, weaving, &c., for the making of coverlets, and that the same have not been made in the same county till of late; that this manufacture has spread into other parts of the country, and was thereby debased and discredited; and therefore it is enacted that none shall make coverlets but the people of York." We see this wretched handicraft now expanded into the most magnificent manufacture to be found in the woollen industry of the world.

Although the West Riding of Yorkshire is the most important seat of the woollen industry in England, it is by no means confined to this district. Other centres are marked by the same singular devotion to particular branches observed in Yorkshire. While heavy pilot cloths, &c., for overcoats, are produced principally at Leeds, pantaloon stuffs and vestings at Huddersfield, blankets at Dewsbury, carpets and damasks for furniture at Halifax, all in Yorkshire; tweeds, tartans, shawls, &c., are made principally at Galashiels and Hawick; imitation cashmere shawls, at Paisley; flannels, in Wales, and at Rochdale; heavy goods, such as blankets and rugging, horse-cloths, &c., in Oxfordshire, and at Witney, Chipping Norton, and Kendal, in Westmoreland; hosiery, at Nottingham, and silk and wool poplins at Norwich; each of these points being recognized as the headquarters of the branches of production above enumerated.

We find a singular deficiency of recent statistics respecting the woollen industry of Great Britain, proceeding from the characteristic reticence of its manufacturers. This is observable in the proceedings of the Chamber of Commerce of Bradford, where we might expect to find detailed information. The most recent statements are those given by Mr. Symonds, in 1861. From them it appears that the total value at that period of the woollen manufacture of the kingdom, separate from the worsted manufacture, was £20,290,079, composed of the following items: 76,000,000 pounds of foreign and colonial wool, valued at £4,717,492; 80,000,000 pounds of British wool, at 1s. 3d. per pound, £5,000,000; 30,000,000 pounds of shoddy, at 2½d. per pound, and 15,000,000 pounds of mungo, at 4½d. per pound, together £609,370; cotton and other warps, used in the union and mixed cloths, £206,537; dye-stuffs, oil, and soap, £1,500,000; wages, £150,000; work people, at 12s. 6d. per week, £4,875,000; rent, wear and tear of machinery, repairs, coal, interest on capital and profit, 20 per cent. on above, £3,381,680. According to the same authority, the worsted manufacture consumes 80,000,000 pounds of British wool, and 15,000,000 pounds of foreign and colonial wool, and employs 125,000 hands. The whole number of operatives engaged on wool is 275,000. The total number of persons, directly dependent upon the woollen industry, is set down at 837,500, including the workmen, there being a larger number of dependent workers in auxiliary trades than in connection with any other manufacture.

It is not proposed to give the details of the compensation of labor in

the woollen industry of Great Britain. English statistical statements of the reliable character of those given respecting the French industry are wanting. The rates obtained from scattered sources vary so much in different establishments, locations, and employments, that facts supplied by a few establishments would lead to no correct conclusions. A better opinion can be formed from a general view than a microscopic examination. M. Reybaud is of opinion that, throwing aside the exceptional cases where the receipts of an English workman and his wife would amount to 3,000 or 3,500 francs, the average receipts for the couple cannot be fixed at less than 1,700 or 1,800 francs, the receipts in Roubaix in corresponding cases being 1,350 francs, and at Amiens 900 francs. The average wages in this industry, although materially less than in this country, particularly for common hands, and women and children, are greatly above those in France and other countries on the continent. The Chamber of Commerce of Leeds, according to the author last referred to, estimates the wages of the workman at 35 francs for the articles best paid, and at 22 francs for those which are least paid, with intermediate rates. American manufacturers admit that it is not so much the lower rate of wages in England against which we have to contend, as the low rates of interest, which permit the employment of vast capital and most the advantageous use of machinery, together with the abundance of labor which may always be recruited from the vast reserve corps of paupers, eager to be elevated to the rank of workmen. A marked improvement in the material condition of the workmen, especially in Yorkshire, has been effected of late years by the increase and the lessening of the cost of subsistence. In the West Riding the labor which, in the period from 1845 to 1847, produced 10 shillings per week, will earn at present 16 shillings per week. The food for a family which then cost 9s. 9d. is now obtained for 6s. In this industry at the present day, the Yorkshire workmen are able to consume animal food at least twice a day, to be respectably clothed, to have some luxuries, and accumulate savings. They are the envy of the workmen of the continent. Without stopping to inquire whether this change has been brought about by chartist agitation, the trade unions, the self-interest of employers, or the moral enlightenment of the English nation, we recognize the fact that the material condition of the English workman is vastly superior to that of his brother workman in France, Belgium, Prussia, and Austria. On the other hand, it is now freely admitted in England that the general and technical education of the English operative is far inferior to that of the workmen of the nations above-named. The Universal Exposition at Paris served to open the eyes of England to the startling fact that she had been making but little progress in manufacturing and mechanical industry since 1851, compared with that made in many other European countries. Among the responses of eminent jurors to a request for information, addressed by the Schools Inquiry Commission of July 2, 1867, we find the following statements as to the inferiority above referred to, and its apparent cause.

Dr. Playfair says: "A singular accordance of opinion prevailed that our country had shown little inventiveness, and made little progress in the peaceful arts of industry since 1862." Professor Tyndal says: "I have long entertained the opinion that in virtue of the better education provided by the continental nations, England must one day, and that no distant one, find herself outstripped by those nations both in the arts of peace and war." More pertinently to the immediate subject of this report, Mr. Huth says: "I am sorry to say that, although we may still be unsurpassed in many of our productions, we no longer hold that pre-eminence that was accorded to us in 1851. The enormous strides that have of late been made by our continental rivals in France, Belgium, Prussia, and Austria, will make it daily more difficult for our woollen manufacturers to hold not only their former prominent position, but even to maintain their present one. I found that it is the want of industrial education in this country which prevents our manufacturers from making that progress which other nations are making. I found both masters and foremen in other countries much more scientifically educated than our own. The workmen of other countries have a far superior education to ours, many of whom have none whatever. Their productions show clearly that it is not there a machine working a machine, but that brains sit at the loom, and intelligence stands at the spinning wheel."

The references here made to the provisions for scientific and technical education upon the continent of Europe are worthy of grave consideration in this country, and the examples cited should stimulate us to extend such institutions as already exist here in the schools of the Cooper Institute of New York, and the Massachusetts Institute of Technology. The cause, however, of the decline of the industrial arts in England, so fully admitted in the testimony of her own experts, is to be found in a source more deeply seated than in a simple deficiency of technical education. Schools of art are the result, as well as the cause, of a national sentiment of excellence, and such a sentiment cannot be predominant in a nation where the ruling idea of its system of manufacture is production at the cheapest possible rate for the utmost possible consumption. A constantly declining standard of excellence is inseparable from this idea. The fruits are seen in the shoddy cloths, the fragile railroad iron, and the hardware, to which no more opprobrious term can be applied than that derived from its chief seat of fabrication—the trashy fabrics and wares inundating every country which does not protect itself by domestic production and defensive duties. It is to the commerce which this system of manufacture nourishes that the famous line of Goldsmith is so justly applicable—

"And honor sinks where commerce long prevails."

The French economists deplore the influence of this idea, which has crept into France, in consequence of the Anglo-French treaty, and they assert that it has exerted a baleful influence upon French artists who have sojourned a long time in England. "They lose their manner," it is said; "their imagination is subdued; it is a flame which becomes extin-

guished by the positive and cold spirit of the English." The woollen manufacturers of this country in producing, as they have done formerly, chiefly for the masses, have followed too much the present English system, instead of aiming at the standard of the old English masters of the woollen industry, and of their descendants in the western counties, who produce for the home markets, or the still higher standard which we have seen prevailing in France. The system which may be profitable for a foreign trade cannot be permanently remunerative for domestic consumption. In fabricating for the home markets the delinquencies of the producer are like personal "sins," which, in the words of the homely proverb, "always come home to roost." The false economy of making poor, or, more properly speaking, dishonest fabrics, is sure to be at length demonstrated by reclamations of buyers, by accumulating stocks, and, finally, by bankrupt establishments.

Our manufacturers, in producing even for the masses, should consider how rapidly the masses in this country are improving in taste and in appreciation of what is really good, and that American consumers will no more be satisfied with ordinary fabrics than American mechanics with cheap tools. Let the ancient device of Roubaix, "*Industrie et probité*," be the rule also of American manufacturers; let the surprising advance of our woollen industry in the last five years be the earnest of its future progress, and the excellence and variety of its products will excite in the people a sympathy in our struggles and a national pride in our achievements. By our own faithful work we shall secure the final condition of success—a positive public sentiment which shall pervade the country in favor of the products of its own soil and labor.

E. R. MUDGE,

United States Commissioner to the Paris Exposition of 1867.

APPENDIX A.

AMERICAN MERINOS.

*Prepared by request, for this report, by Hon. Henry S. Randall, LL. D.,
President of National Wool Growers' Association.¹*

Full-blood American merino sheep, as that designation is now understood, include only full-blood descendants of the merinos imported from Spain into the United States near the beginning of the present century. Six were introduced by different persons between 1793 and 1802. In the last named year, Mr. Livingston, the American Minister in France, sent home two pairs obtained from the French government flock. Later in 1802, Colonel Humphreys, the American Minister in Spain, on his return from his embassy, shipped a flock to the United States, of which 21 rams and 70 ewes safely reached his farm in Connecticut. The merinos imported prior to these last have not, so far as is known, left any full-blood descendants.

Col. Humphreys published no detailed account of his purchase or of the previous history of his sheep. He evidently regarded the fact that he purchased them, and that he obtained them directly from the merinos of Spain, as all that was important to be known, and as a sufficient guarantee of their blood and quality, and so indeed it was. He was a singularly high-toned and public-spirited man—wealthy—intent on doing a patriotic service to his country by introducing these sheep; and that he fully supposed that he had accomplished the latter object he himself bears witness. In his poem “On the industry of the United States of America,” he proudly declares:

“Not guarded Colchis gave admiring Greece
So rich a treasure in its golden fleece.”

The particular Spanish family or families from which his sheep were selected cannot now be regarded as a matter of any consequence; but from investigations which circumstances formerly impelled me to make among all the accessible public and private records and facts appertaining to the subject, I came to the undoubting conclusion that they were drawn from a single family, and that the *Infantado*.

Judging from the statements in Colonel Humphrey's manuscript letters lying before me, he not only found great satisfaction but great success in breeding his merinos. The very ones he brought from Spain, he says, increased half a pound in their fleeces; and their descendants continued to improve in that and every other particular. He speaks glowingly of their hardiness and propensity to fatten; and in the highest terms of their mutton. This gentleman died in 1818, when causes, hereafter to be

¹ Author of *Sheep Husbandry in the South*, *Fine Wool Husbandry*, *The Practical Shepherd*, &c., &c.

detailed, had sunk the merinos into contempt and neglect. His invaluable sheep were then scattered, and, as a general thing, they appear to have fallen into the hands of those who attached no great value to their blood, for I can learn of but two or three instances where they were preserved distinct after 1826.

The next importations of importance were made by Mr. William Jarvis, American consul at Lisbon, Portugal, in 1809 and 1810. Taking advantage of the offers of the Spanish Junta to sell the confiscated flocks of certain Spanish nobles, he bought and shipped to different ports in the United States about three thousand eight hundred and fifty merinos. He wrote to me, in 1841, that about thirteen hundred of these were Aqueirres, two hundred Montarcos, the rest Paulars and Negrettis—mostly the former. He says: "Those I reserved for myself were composed of about half Paulars, a quarter Aqueirres, and the other fourth of Escurials, Negrettis and Montarcos, which I subsequently mixed together."

In regard to other importations at this period, Mr. Jarvis writes in the same letter: "There were sent in the latter year (1810) by others about two thousand five hundred, composed of Paulars—had of General Downie—Montarcos, Aqueirres and Guadalupes. Part of those went to New York, part to Boston. All those sheep were Leonesa, trans-humanites, and were of the prime flocks of Spain. I have been able to be thus minute in relation to the merinos in 1809 and 1810, as I was then American consul at Lisbon, which was the port from which they were all shipped, it being only about one hundred miles to Badajos, and the nearest seaport to that place." Some of these cargoes did not reach the United States until 1811. I have elsewhere given the names of a number of the importers, and it is not necessary to repeat them here.

The circumstances existing at the time of the introduction of these sheep were highly propitious to their careful breeding and rapid diffusion. From 1807 to 1812 the maritime regulations of England and France, and our own retaliatory ones, paralyzed, and during a portion of the time entirely suspended, our foreign trade; and the ensuing war with England, which lasted to 1815, completely swept our commerce from the ocean. Thus our people were driven to the establishment of wool and other manufactures, and to the production of the raw materials. State legislatures, the public press, and politicians of every party and grade, encouraged efforts in that direction, and patriotic as well as pecuniary enterprise warmly responded to these appeals. The new importation of merinos was hailed with enthusiasm. From \$1,000 to \$1,500 a head was frequently paid for them. Flocks of full-bloods or grades were started in all parts of the country. Unwashed full-blood wool rose to \$2 50 a pound during the war.

The peace of Ghent exposed our infant and unprotected manufactures to the competition of the world. The exhaustion and derangement of our finances accelerated their overthrow, and they fell without a strug-

gle, and irretrievably. There was no longer any market for fine wool in the United States; and merinos valued at \$1,000 a head in 1809 sold for a dollar a head in 1815. Their propagation as a separate breed was thenceforth abandoned by most owners, and the great mass of them became merged in the common coarse sheep of the country.

This state of things continued until 1824. In the tariff of that year the protective policy on wool and woollens, inaugurated by the tariff of 1816, was so far extended that it was supposed it would make fine wool production again profitable. The Saxon (merino) sheep were introduced, and created a new fine wool furor equal to that between 1809 and 1815. The tariff of 1828 increased the protection and increased the excitement.

If we did not know the singular one-ideaism which so often characterizes these "improvement" manias, it would be a subject of astonishment that while the Saxon sheep were sought with so much eagerness, commanding quite equal prices with those of the Spanish merinos fifteen years earlier, the pure blood flocks of the latter yet in the country attracted comparatively little notice, and they were chiefly valued because they would grade up more rapidly than other sheep toward the Saxon standard of fineness; in other words, make a better cross with the Saxons. Most unfortunately a large share of the holders of the Spanish, or "old-fashioned merinos," as they were then called, adopted the same theory of relative value and rushed into the cross, breeding steadily towards the Saxons, so as to obliterate the distinctive Spanish characteristics as rapidly as possible. Yet at that very time, and at all subsequent times, prime Spanish fleeces were worth more in market than Saxon fleeces. The greater weight of the former more than compensated for the greater fineness of the latter. The Spanish were a strong, hardy, thoroughly acclimated sheep, well adapted to our climate and systems of husbandry. The Saxons were the reverse in every particular.¹

Yet for upwards of fifteen years the Saxons maintained an almost undisputed ascendancy. Their faults were attributed to want of acclimation. They had cost too much to be readily given up. They were in the hands of the wealthy influential farmers, prominent in agricultural literature, and prominent in politics, who believed themselves and convinced others that the conditions of success could be secured by protective legislation. A corresponding class of manufacturers urged the same views. A constant struggle was kept up on the floors of Congress between the friends and enemies of protection, each usually maintaining extreme views, so that when either was victorious extreme measures

¹ To a similar statement in "Fine Wool Husbandry" I appended a note, which with a slight change I will copy here:

"I trust no former breeder of the Saxons will complain of these remarks, when I say '*quorum pars fui*. Thirty-eight years ago I became the owner of a pure Spanish flock. Subsequently I purchased some Saxons, and was so gratified with the produce of a few picked sheep, that I bought and bred a flock usually numbering from 500 to 700. They were derived from the most celebrated flocks. I kept them several years and gave them a fair trial before going back to the Spanish merinos, which, very fortunately for myself, I had never entirely abandoned."

were adopted. Consequently there was none of that steadiness or permanency in the public policy, under which industrial interests materially affected by foreign competition can alone flourish. I have not space here to give the provisions of the different wool and woollen tariffs, but a glance at the prices of wool under them will throw some interesting light on the subject under examination.

Under the tariff of 1824, in force until September, 1828, fine wool averaged a trifle over 45 cents a pound; under the tariff of 1828, extending to March 3, 1832, about 57 cents a pound; under the tariff of 1832, extending to January, 1834, about 57 cents a pound; under the tariff of 1833, to towards the close of 1837, about $66\frac{2}{7}$ cents a pound; thenceforth under the same tariff, extending to October, 1841, about $51\frac{3}{8}$ cents a pound; under the tariff of 1841, extending to September of that year, about $46\frac{1}{4}$ cents a pound; under the first year of the tariff of 1842, about $35\frac{1}{4}$ cents a pound; thenceforth under the same tariff, extending to December, 1846, about 41 cents a pound. During this entire period of 22 years, fine wool did not on the average exceed medium wool in price more than 10 cents a pound, and medium still less exceeded coarse.¹

During the same period, pure Saxon sheep in the best flocks averaged less than three pounds of wool per head. In 1840 the flock of Henry D. Grove, the celebrated German importer and breeder—not numbering over 200 sheep, and well kept—yielded an average of 2 pounds 11 ounces of washed wool a head, and he regarded this product as so satisfactory that he adduced it as a proof of the value of his favorite breed in that controversy between the advocates of the Saxons and Spanish merinos which was then filling our agricultural publications.²

This controversy had opened in about 1835. At that period small picked lots of Spanish merinos, purchased by different persons of Mr. Jarvis, yielded $4\frac{1}{2}$ pounds of washed wool a head. The flocks of Stephen Atwood, of Connecticut; of John T. Rich, of Vermont; of Francis Rotch, of New York, and my own, yielded an equal amount.³

The increase in the weight of Spanish fleeces was thenceforth rapid. In 1844, my Humphreys sheep yielded 5 pounds 13 ounces of washed wool a head,⁴ and a small lot of Rich ewe tegs purchased in Vermont, five pounds. In 1845, Mr. Stephen Atwood wrote to the author of the

¹ From 1827 to 1861 inclusive, a period of 35 years, the average price of fine wool at Boston was 50 3-10 cents; of medium, 41 8-10 cents; of coarse, $35\frac{1}{2}$ cents. Fine wool averaged 15 per centum higher than medium, and medium 14 per centum higher than coarse.

² See his letter to me in "Transactions" of New York State Agricultural Society, 1841, p. 333.

³ Mr. Atwood's flock and my own, here referred to, were descended from Colonel Humphrey's flock; Mr. Rich's from a Paular importation made at New York in 1811; Mr. Rotch's were selected from different flocks.

⁴ Four of the ewes had two years' fleeces on, but I thought this fully offsetted by the number of tegs in the flock, which, under the usual treatment of those days, yielded considerably less wool than grown sheep. My Premium ram's first fleece in 1844 was 10 pounds. In 1847 one of my ewes produced 7 pounds 10 ounces. In 1849 one of my rams produced 13 pounds 3 ounces. All were well washed.

American Shepherd, that his flock consisted of 150 half ewes and half rams and wethers; that his ewes yielded five pounds of washed wool per head, and his lambs an equal amount; that his wethers yielded six pounds, and his rams from seven to nine pounds; that his heaviest ewe's fleece in the preceding spring was six pounds six ounces, and the heaviest ram's fleece 12 pounds 4 ounces. I think a few other flocks yielded about equal amounts of wool, but the facts are not before me. The prime merinos of that period then were producing upwards of two pounds more of wool a head than prime Saxons, while that of the latter fetched in the market but $6\frac{3}{4}$ cents per pound most in 1845, and but $6\frac{1}{4}$ cents per pound most in 1846.

The Saxon breeders had never received anything like a proportionable remuneration for their wool. They had lived on hopes deferred, looking for changes which never came. When the tariff of 1846 overthrew the broadcloth manufactures of the country, there was no longer any ground for hope, and the Saxon sheep rapidly disappeared and gave place to the American merinos, as the Spanish sheep were thenceforth generally called.

They had indeed become a distinctive variety, like the Saxon Merino, the French merino, &c., presenting both essential and visible differences from their Spanish ancestors or from any other merino family. They differed materially from the Spanish in amount of wool, size, and form. The weights of prime American washed fleeces have just been stated. Livingston gives the average weight of the Spanish ram's fleece, *unwashed*, at the beginning of this century, at $8\frac{1}{2}$ pounds—Youatt at eight pounds. Both give the average of the unwashed ewe's fleece at five pounds. The King of England's carefully selected Negrettis, about 100 in number, yielded, for five successive years, (1798–1802,) an average of $3\frac{1\frac{5}{2}3}{47}$ pounds of brook-washed wool—scoured weight $2\frac{1\frac{5}{2}2}{47}$. This included the wool of some wethers (the number unspecified) but no rams.¹ In 1801 Dupont de Nemours and an associate sent to the United States unquestionably the largest-fleeced Spanish ram ever introduced here.² He produced $8\frac{1}{2}$ pounds of washed wool. Colonel Humphreys mentions it as a matter of note, in a manuscript letter which I have read, that a merino ram bred by himself yielded seven pounds five ounces of washed wool.

In respect to size and form, Petri, who visited Spain in the early part of this century to examine its merinos, gave a table from which I select

¹ See Sir Joseph Banks's annual reports concerning this flock.

² Dupont de Nemours was head of the commission appointed by the French government to select the merinos given up by Spain by the treaty of Basle. He and M. Delessert sent four rams to America, three of them intended for their own farms in this country, and one for President Jefferson. All but one perished on the passage. The remark in the text is confined to Spanish sheep imported from Spain. French merinos of heavier fleece were subsequently introduced.

the following admeasurements. I add some corresponding ones of American merinos:

Names of flocks.	Weight, including wool.	Length from mouth to horns.	Length from horns to shoulders.	Length from shoulders to tail.	The whole length.	Circumference of the belly.	Height of the fore legs.	Height of hind legs.	Distance of hip bones apart.
Negretti:	<i>Lbs.</i>	<i>In.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>Ft. in.</i>	<i>In.</i>	<i>In.</i>
Ram	97	9½	1 7	2 2	4 6½	4 1½	1 3	10	6
Ewe	67	8½	1 6	2 1	4 2½	4 1½	1 1	9½	4½
Infantado:									
Ram	100½	10	1 6	2 3	4 7	4 2	1 0	9	6
Ewe	70	9	1 5½	2 1	4 3½	3 11	1 0	8½	5½
Guadeloupe:									
Ram	97½	9	1 6	2 2	4 5	4 5½	1 0	8	6
Ewe	69	9	1 2	2 1	3 11	3 9	10½	6½	4
Estantes of Sierra de Somo:									
Ram	96½	9½	1 6	2 0	4 3½	4 2½	1 0	8	6
Ewe	62½	9	1 2	2 1	4 0	3 10	11	7	5
Small Estantes:									
Ram	42	7½	1 3	1 9	3 7½	3 2	10	6½	3
Ewe	30	7	1 1	1 6	3 2	2 10	8	6	3
American merino:									
Ram	122	9	10	2 4	3 11	4 4½	11	9	9
Ewe	114	9½	10	2 4	3 11½	4 1½	11	9	8
Ewe	122	9	10	2 5	4 0	4 3	9	9	8
Ewe	100	9	11	2 3	3 11	4 ¾	8½	8	8

The weights and measures given of the Spanish sheep are Austrian, a little exceeding English weights and measures. From a careful comparison of all the figures, I think Petri must have taken the circumference of the belly without compressing the wool, for if there was no greater difference in this particular, it is difficult to see from the above table—notwithstanding the marked superiority in breadth of hip of the American sheep—why they should have weighed so much the most. The American ram represented in the table was a small one, not usually weighing over 100 pounds with his fleece off. A full-sized one of the family (Infantado) would have weighed from 10 to 25 pounds more. The ewes were rather above the average of my grown sheep of the same family, and were in good ordinary condition. My measurements were made in 1861, and therefore do not exactly represent merinos of 1846; but I think the change in size and form was not very considerable between those dates; and I am not aware that any corresponding data of the American merinos of 1846 are preserved.

Some persons perhaps will get a clearer idea of the difference between the form of Spanish and American merinos from descriptive terms than from the above figures. The American sheep was far the lowest, roundest, and most compact animal, broader on the hip, fuller and broader in the bosom and breech, and shorter, proportionably, in the neck and legs. The Spanish migratory sheep travelled 800 miles a year, and, all things

considered, with great rapidity; and his deep, narrow chest, longer legs, and lean form—making some approach to that of the deer—adapted him to that necessity. The American farmer had no occasion for such properties, and he bred a sheep better calculated to take on flesh and fat, and possessing more of the essential points which are found most profitable in animals not required to travel far for their feed.

The American merino has not much increased in size during the last 20 years, and probably scarce any since 1861. Our breeders, indeed, have sought no such increase, considering it unprofitable in respect to wool production, inasmuch as smaller animals have more surface in proportion to weight than larger ones, and believing that a development of size greatly beyond the long established limits of the breed is unfavorable to vigor, hardiness, and easy keeping. I think the introduction of French merinos (1840–1850) exerted much influence on public opinion and taste in this particular. These great overgrown sheep, which at first attracted so much admiration, proved so completely weak and worthless that our breeders got to eschew everything resembling them, and the popular impression was that their want of constitution was due to their extraordinary size for the breed, or rather to the same causes which had produced that size.¹

The Rich or Paular family of American merinos, when not much mixed with the Humphreys or Infantado family, are smaller than the latter—having been bred purposely in that direction by their earlier proprietors, to adapt them to the short keep of the Vermont hills. In their natural and unpampered state, they are nearly as hardy under privation and exposure as the British mountain breeds. The unpampered American Infantado is also a hardy sheep, but requires more food than the former. The two families bear the same relation to each other as do Devon and short-horn cattle. One is the most profitable in sterile and exposed situations, the other on rich lands and generous keep. Latterly, the Paular family have been, to a large extent, crossed with and bred towards the Infantados, but I think it highly expedient that they be preserved as a distinct variety, to meet the wants of many portions of our country.

While the carcass of the merino has been so materially improved in the United States, and while its improved form has doubtless diminished its capacity for long and rapid travelling, I am not aware that it (I speak of unpampered sheep) has lost in any characteristic of value for its present situation. From my own recollections of the breed when it was but little changed from the original Spanish model, and from all the

¹ I do not intend to apply these remarks indiscriminately to the merinos of France. The stock imported by Mr. D. C. Collins, in 1840, from the royal flock at Rambouillet, were not thus overgrown. Their size, however, materially exceeding that of the American merino, was an entire novelty and a most captivating one to the popular eye. Consequently most of the later importers selected not only from the largest French stocks, but the largest sheep of the flocks from which they purchased—often paying comparatively little attention to other characteristics. These gaunt, unthrifty monsters, required an excess of keep and care, and then they generally perished within a year or two of the period of their introduction here.

older recollections of experienced and reliable men with whom I conversed many years ago on the subject—men in various instances whose recollections of these sheep extended back to the time of their importations in 1809–1811, I am satisfied that their vigor of constitution has been on the whole increased; that they are more prolific, and furnish their offspring more milk; and it is certain, as already said, that they fatten more rapidly and better, and furnish better mutton. They accumulate, it is true, far less fat than the English mutton breeds; but good merino wethers are favorites in our markets. Their meat is darker colored and shorter grained than that of English sheep. Its flavor is good. Multitudes of Americans prefer it to English mutton, and especially to Long-wool mutton; and the lambs of Southdown rams and grade merino ewes sell in our early markets for equal prices, pound for pound, with full blood Southdowns; perhaps the only other variety which habitually commands an extra price. And it has been found that pampering from birth, as mutton sheep are pampered, gives the merino a very liberal share of that early maturity which has been denied to it by those who have described the original variety. I am not contending, by any means, that the improved American merino rivals the British breeds as a profitable mutton sheep; but I would show that it no longer takes the low rank in that particular which has been traditionally assigned to it, and that its mutton has become an important consideration in estimating its general value, or its comparative adaptation to special localities.

But it is in weight of fleece that the American merino has made the most remarkable advance beyond its progenitors. We have seen that in 1844–'5 small very choice lots yielded an average of over 5 lbs. a head of washed wool. Now flocks of several hundred, including tegs, without any wethers and not more than one per cent. of rams, on fair ordinary keep, yield an equal amount. Flocks of picked sheep yield 6 lbs. a head, and small, high-kept lots a pound or two more, all of washed wool.

It has become difficult indeed, for reasons which will presently appear, to learn accurately the amount of well-washed wool in a large proportion of the heaviest-fleeced small flocks. These are usually in the hands of “breeders”—ram-sellers, as they are termed in England—who raise sheep especially to sell them for breeding purposes, and who expect to obtain extraordinary prices. This business has been highly remunerative for a number of years; and during the recent war of the rebellion, the demand for choice merinos swelled into a mania. According to the popular idea “king cotton” was dead, and there was to be no resurrection for him. Woollen fabrics were permanently to supersede cotton fabrics in clothing, and in everything else where it could be employed as a substitute. There was therefore to be an enormous and perpetual demand for wool at high prices. Stimulated by such golden prospects, sheep holders increased their flocks, and made the most energetic efforts to improve them by the purchase of valuable rams; and thousands of

persons, wholly inexperienced in the business, abandoned other pursuits to embark for the ovine *El Dorado*. I think, speaking within bounds, I received two or three thousand letters, between 1861 and 1867, from lawyers, doctors, small merchants, clerks, mechanics, men out of business, clergymen, and farmers not previously engaged in sheep husbandry, who propounded inquiries on the subject of breeds, the most profitable localities for wool growing, and other matters connected with the establishment of flocks.

The prices of sheep rose above the high-water marks of 1809-15 and 1824-28. Without speaking of "refused offers," which sometimes are not very real, I know that an American merino ram actually sold for \$5,000; quite a number of others at \$3,000 to \$4,000 each; and multitudes at \$500 to \$1,000 each. Several ewes were sold at \$3,000 each; more at \$2,000 each; and many at \$500 to \$1,000 each. There was the most eager competition to secure celebrated and costly animals; for every man expected to become a ram seller forthwith, and he found no difficulty in convincing himself how very soon he could thus obtain back his original expenditure, and then, by an easier process than was dreamed of by the alchemists, transmute his sheep into gold. In the permanent improvements of flocks, these costly animals, it is true, often richly paid for themselves;¹ but many of the recent adventurers in the business were not satisfied with this—were not satisfied because they could not at once sell for as high prices as they had given; and when at the close of the war a temporary depression necessarily ensued in the woollen and consequently in the wool markets, (owing to causes which do not demand explanation here,) they were as anxious to abandon as they had been to embark in sheep husbandry.

This remarkable era in merino breeding, commencing in sound measures of improvement, but culminating during the war in the excitement which I have described, developed several fashions in breeding and management which were altogether new in the business. Quality of wool was little talked about. Weight of fleece was the primary con-

¹ Take an example. My American merino ram, "Twenty-one per cent," (measurements, &c., of which are subjoined to Petri's table, heretofore given,) was previously owned by Major Davis Cossit, of Onondaga, New York, and used by him in 1859 and the two succeeding years. His ewes were Saxons, with sufficient American merino blood to yield, on ordinary keep, about 4 lbs. of washed wool a head. In 1862 the fleeces of the progeny of this cross were first weighed separately. Eighty-three two-year old ewes yielded 552 lbs., and 80 yearling ewes 504 lbs. of washed wool—within a fraction of 6½ lbs. a head. Each lot was the entire one (of ewes) of the year. In 1863, 65 two-year old and 92 yearling ewes yielded 1,119½ lbs. of washed wool, or an average of 7 lbs. 2 oz. a head. The yearlings were not over 14 months old when shorn, and none of the sheep had been pampered. The original stock of ewes would never have fetched over, say, \$8 a head immediately after shearing. For their progeny (ewes) the owner was offered \$30 a head. The grade rams were mostly sold in lots, for \$15 to \$25 a head. I used this ram three years on my full-blood ewes; and I think he permanently increased the wool product of the flock half a pound per head—quite as extraordinary a gain as the preceding one, when the blood and previous product of my flock are considered. This remarkable ram was bred by Mr. Hammond, of Vermont.

sideration ; and it became the custom of many “breeders” to weigh the fleeces in the yolk, because, I suppose, it gave them an advantage over others. A rigid system of housing their sheep from contact with rain or snow the year round would preserve all the yolk in the fleece, and this would add to its weight several pounds. The holders of larger flocks could not do this without great inconvenience and expense. The former, therefore, were enabled to go into the newspapers with far higher statements of weights of fleeces. Inasmuch as this system of housing and preserving all the yolk in the wool gave the fleece externally a very dark color, that color soon became a prime necessity of fashion. And as the more the yolk, the more the weight and the darker the color, yolk itself was as carefully bred for as wool. I have seen it literally dropping from the fleece under a hot sun. As a high-fed sheep produces considerably more wool and yolk than an ordinarily kept one, a system of pampering was also extensively resorted to. Many of the summer and winter housed flocks were fed grain to the utmost verge of immediate safety, and far beyond the bounds of ultimate safety ; for such continued forcing is destructive to the constitution and longevity of merino sheep, as all will bear witness who have tried or observed its effects.

Under the above system of breeding and treatment, and sometimes without any special pampering, merino rams’ fleeces in the yolk are frequently reported as weighing upwards of 25 pounds, and some have risen to 30 pounds. Ewes’ fleeces range from 10 pounds to 15 pounds, and sometimes individuals or small lots have gone higher. Unfortunately these weights afford scarcely an approximate criterion of the actual weight of the *wool*, the proportion of yolk to wool possessing no uniformity. The breeders’ customs above described constitute the reason which I promised to give, in a preceding part of this paper, why the present amount of well washed wool in most of the heaviest fleeced flocks cannot be accurately determined.

The practice of housing sheep from rain and snow for the preceding objects is not a fraud, if distinctly avowed to all buyers. But I think it productive of no benefit, and of considerable injury. It is a useless waste of a good deal of time, and occasionally produces loss in other respects. The new-mown hay or grain must be left to get wet on the ground, to the serious deterioration of its quality, rather than have the precious weight-giving and color-giving yolk washed out of the fleece ! And there can, it appears to me, be no reasonable doubt that this habitual non-exposure to the ordinary changes of weather must, in the course of time, to a greater or lesser degree, beget an incapacity to endure such exposures with entire impunity. Besides, this housing, if ever so frankly proclaimed, tends to warp the judgment of all buyers, and especially inexperienced buyers. If it did not give a fictitious value to the animal—rendering it more salable than sheep of equal value not thus treated—what would be the use of it ? It is perfectly notorious that it, with early shearing,¹ does

¹ These “fitted” sheep are sheared from a month and a half to two months earlier than sheep in general.

so alter the appearance of sheep, that a pair of twins of the closest resemblance, one thus treated and the other not, scarcely look as if they belonged to the same variety, and the "fitted" one will far outsell the other. It is considered the breeder's right, in all kinds of domestic stock, to "put the best foot forward," and it is equally done with other breeds of sheep; but it is a pity that a higher standard of action cannot be permitted to prevail. Such fashions beget inducements to direct fraud. Thousands of *painted* sheep (painted to the *true* color by a preparation of oil, burnt umber, and a little lampblack) are annually hawked about the country, with pedigrees as artificial as their color, and sold as genuine simon pures.

Fitting sheep for sale by pampering is fraudulent, for it is never avowed or admitted, and if it were so, there can be no honest or decent excuse for a practice which is directly and undeniably fatal to the well-being of the animal. We have no right to poison what we sell, because we know there will be fools to buy it, and to buy it more readily because it is poisoned. Another result has followed this indiscriminate scramble for huge fleeces. Those who have carried it farthest have usually considerably depreciated the quality of the wool. The finest fleeces are not generally the heaviest. The greatest combination of wool and yolk—however coarse, uneven, and even hairy, the former—has been what these extremists have looked for in their breeding rams; and the progeny of such rams must of course partake of the same characteristics. I shall presently speak of the prevailing character of American merino wool.

To complete my account of these animals I must allude to one more modern fashion, that of breeding those folds and corrugations of the skin, usually termed "wrinkles." They, to a certain extent, characterized the original Spanish merino when introduced into this country, but they were confined principally to the neck. To a reasonable extent they are approved of in all countries where the merino is bred, being understood to indicate heavy fleeces. But our American extremists reasoned that, if some were desirable, more would necessarily be better; and these wrinkles "took the eye" of novices. Our most sagacious breeders have continued to resist this innovation; but it is not uncommon to see rams, and even ewes, in addition to enormous neck-folds, closely covered from head to tail with folds in the skin, elevated an inch or more from the surface of the body. There are two profound objections to this. The wool on the upper part of the ridges very rarely corresponds in quality with that between them, thus destroying all evenness of fleece; and it often takes an expert shearer two hours to clip off the fleece of one sheep evenly. With shearers at \$2 to \$2 50 a day, the last consideration will prove an important one among wool growers who own sheep in any considerable numbers, and this miserable fashion cannot long prevail.

Notwithstanding the shams and deceits, as well as more innocent practices, which have been resorted to by a class of sellers of American merinos to produce great fleeces in their unwashed state, there has

unquestionably been a very great improvement in the actual weight of the washed or scoured fleeces within the last few years. I do not believe there is any other national family of merinos, or any other breed of sheep whatever, that can vie with them in this respect. This fact is, I think, established by the scouring tests made so frequently during the last few years by State and local wool growers' associations, and by individuals. In all these, which have commanded any attention, the sheep have been publicly shorn at the meeting of an association, or, in individual tests, in the presence of a number of reputable witnesses. The age of the fleece has been proven by affidavits. Where the test made was the proportion of wool to weight of animal, the animal has been publicly weighed when shorn, and its condition noted. The associations have selected competent and reliable wool manufacturers to perform the scouring, and required of them statements of processes and results. The New York State association, in its scouring tests of 1865, 1866, and 1867, appointed a committee of eminent and experienced gentlemen to make an examination of all the facts and of the scoured wool;¹ and other State and county associations, and individuals, have taken these or other steps deemed necessary to secure accuracy and command entire public confidence.

These experiments have demonstrated that the *scoured* fleeces of American merino rams of full growth not unfrequently range from six to over eight pounds, and in a recent instance, in this State, (New York,) one reached the weight of nine pounds and three ounces, the fleece being of 11 months and 21 days' growth. This ram was three years old, weighed 108 pounds after shearing, and was in good condition. His unwashed fleece was 24 pounds. The *scoured* fleeces of full-grown American merino ewes frequently weigh from five to over five and a half pounds; the shorn carcases weighing from, say, 65 to 75 pounds. And it should be remarked that the heaviest fleeced sheep of the most celebrated flocks have, in very few instances, been entered in these scouring tests, for the reason, doubtless, that their owners have not been willing to risk their established reputation by any new or unnecessary experiments.

From the preceding facts it appears, first, that prime American merinos produced more *washed* wool in 1844-'46 than was produced of *unwashed* wool by the original stock in Spain, at their palmiest period, the opening of the present century; second, that prime American merinos produce about as much *scoured* wool now as they did of *washed* wool in 1844-'46, and nearly twice as much scoured wool as the picked merino flock of the King of Great Britain from 1798 to 1802.² They undoubtedly produce twice as much scoured wool as the average of the prime Spanish flocks at that period.

¹ The committee also appraised the value of the scoured wool, and presented various other comparative data of value, not necessary to be mentioned here.

² I take into account the wethers in the King's flock, which yield considerably more wool than ewes.

It remains to speak of the quality of American merino wool. From the best information I can obtain, the wool of the descendants of the original Spanish sheep imported into this country rather gained in quality between 1809 and 1824. This was undoubtedly true of the Jarvis and Humphreys stocks; and from 1824 to 1846 there was a more decided gain in this direction, owing to the taste for fine wools diffused by the prevalence of the Saxons. After 1846, for reasons already stated, the demand for broadcloth wools ceased, and our merino breeders sought a rather coarser and also a longer staple, because it was equally adapted to the fabrics in which it was thenceforth employed, and because much heavier fleeces could thereby be secured. It is now, in our heaviest fleeced flocks, too coarse for a good quality of broadcloths, and it is also quite too long for that purpose, two inches and a half being not far from the medium length, and wool three inches long being frequently met with. It has a remarkably strong staple, and is found admirably adapted to fine wool combing purposes and to those medium fabrics which constitute so large a proportion of the consumption of the United States.

In regard to the particular properties of our full blood and grade American merino wools, the executive committee of the National Association of Wool Manufacturers, the committee itself consisting of the most eminent and successful manufacturers in the United States, bore the following voluntary testimony in a public report made in 1866: "In a class of fabrics, entering perhaps more largely than any other into general consumption—that of flannels—the superiority due principally to the admirable adaptation of the common wools of this country, their strength and spinning qualities is so marked as almost wholly to exclude the foreign flannels. American fancy cassimeres compare favorably in finish, fineness, and strength, with those imported. Our delaines, owing again, in a great measure, to the excellence of our merino combing wool, surpass the fabrics of Bradford at the same price. The excellence of American shawls was admitted at the Great Exhibition in London." And they subsequently add: "It has been the experience of all nations, that the domestic supply of this raw material has been the first, and always the chief, dependence of its manufacturers, and the peculiar character of this material has impressed itself upon the fabrics which each country has produced. Thus, in the fine wools of Saxony and Silesia, we have the source of German broadcloths; in the combing wools of England, the worsteds of Bradford; and, in the long merino wools of France, the origin of her thibets and cashmeres. The peculiar excellencies of American wools have given origin to our flannels, our cassimeres, our shawls, and our delaines; and they give strength and soundness to all the fabrics into which they enter."

A gradually reviving demand for wool suitable for broadcloths and some other fine fabrics has led to the introduction, within a few years, of merinos of shorter and finer staple, from Silesia, in Prussia; sheep vastly superior to our former Saxons in size, constitution, and product of wool.

There are also Saxon sheep, so-called, of pure merino blood, in contiguous portions of western Pennsylvania, eastern Ohio, and the part of West Virginia which lies between those States, which furnish a very high quality of broadcloth wool. They too are larger, hardier, and yield more wool than the original Saxons imported in 1824-1828. But any account or description of these families does not come within the province of this paper.

CORTLAND VILLAGE, *New York, July, 1868.*

APPENDIX B.

THE ANGORA GOAT; ITS ORIGIN, CULTURE, AND PRODUCTS.¹

By JOHN L. HAYES,

Secretary of the National Association of Wool Manufacturers.

The Jardin des Plantes, the source and model of our societies of natural history, gave to the world not only Buffon and Cuvier, who, by their brilliant labors, won for the researches of the naturalist a place in the domain of science, before accorded only to studies of the imponderable elements, but two other scarcely less illustrious naturalists, whose labors were inspired by the purpose of applying their favorite science to increase the material resources of man. To this idea France owes the merino sheep with which Daubenton endowed her, and the Imperial Society of Acclimation, the creation of Geoffroy St. Hilaire, which aims to submit to practical study all the animals by whose acquisition the geographical zone of France can be advantageously augmented. Trusting that this society may regard with favor the discussion of a subject akin to those which have received the attention of the great practical naturalists of France, I propose to submit a memoir upon the Angora goat, the last acquisition which our agriculture and manufactures have received from the animal kingdom.

When we reflect that of the numerous species which compose the animal kingdom 43 only are at the command of man, and that the only lanigerous animal extensively appropriated in this country, besides its product of food, has furnished in a single year, from domestic sources, 70 per cent. of the raw material for a manufacture valued at over \$120,000,000, we must regard the acquisition of a new animal, producing food and material for clothing, as an epoch in the industrial history of the country. It is the peculiar province of a society like this to aid the development of this new national resource by shedding the fullest light upon the specific and geographical source of this animal, upon its habits, food, and diseases, the use of its products, and, above all, upon the laws which govern its reproduction; in a word, to make upon this subject natural history *applied*. As my object is less to present original matter than to diffuse the best authenticated information, corrected by your criticism, or sanctioned by your approval, a work rendered necessary by the errors abounding in agricultural reports and publications, I shall avail myself of the memoirs of M. Brandt, M. Tchihatcheff, M. Sacc, and M. Boulier, naturalists of high repute, and the very numerous notices scattered through the proceedings of the Imperial Society of Acclimation.

The description of this animal, given in 1855, by M. Brandt, director of the Museum at St. Petersburg, and distinguished among the zoologists

¹Read before the Boston Society of Natural History, March 18, 1868.

of Europe for his conscientious work and profound knowledge, is as follows: "The magnificent example of the Angora goat, which the Museum of the Imperial Academy owes to M. Tchihatcheff, produces at first sight the general impression of a domestic goat, when attention is not directed to its thick and silky fleece, to its flat ears turned downwards, and its inconsiderable size. But it is precisely these traits which impress upon this animal a distinct seal, which give it the character of a peculiar race, whose origin is perhaps not the same as that of the domestic goat. The extremity of the snout, the cheeks, the nasal and frontal bone, as well as the ears, and lower part of the legs below the tarsal articulation, are covered with external hairs, which are shorter and thicker than those which cover the above-mentioned parts in other species of goats. The forehead has soft hairs of less length, less applied to the skin, and, in part, curled. The hair of the beard, which is pointed and of moderate dimensions, being six inches in length,¹ is stiffer than the hair of the rest of the body, but less so than that of the beard of the ordinary goat. The horns, of a grayish white tint, are longer than the head; at their lower part the interior marginal border turns inwards in such a manner that in this part they appear broad viewed in front, and narrow when seen exteriorly; at half their extension they direct themselves moderately backwards, and turn spirally outwards, so that their extremities, directed slightly upwards, are very much separated one from the other, and circumscribe a space gradually contracting itself. The whole of the neck, as well as the trunk, is covered with long hairs, which, particularly upon the neck and lateral parts of the body, are twisted in spirals having the appearance of loosened ringlets, it being observed at the same time that they unite themselves into rolled tufts, a disposition which is less marked in the anterior part of the neck. The hairs which exhibit the greatest length are situated above the forelegs, and are almost nine and one-half inches long. Those of the neck are a little shorter and are nine inches long, and those of the belly eight inches three lines. The length of the hair with which the lateral parts of the body, as well as the back, are covered, is only seven inches six lines, and that of the hair of the hind legs six inches to seven inches. Finally the slight stiff hair of the tail is about four inches in length. The color of the robe of the animal is a pure white, here and there slightly inclining to yellow. The hoofs, somewhat small in proportion, are, like the horns, of a grayish white tint. The hair is, without exception, long, soft, and fine; it is at once silky and greasy to the touch, and shows distinctly the brilliancy of silk."

M. Brandt observes that the hairs corresponding most to external hair have only a third, or at most do not attain half, the thickness of the external hair of the common goat; and that the external hair of the wild and domestic goats is not only closer, stiffer, and more massive, but has a more considerable torsion and a less even surface; that is to say,

¹ All the dimensions given by M. Brandt are in German measurement. One German foot is equal to 1.0299 English feet.

it is rougher and more scaly. He also remarked that "the walls of the hair of the Angora goat being thinner than those of the hair of the common goat, the substance contained in the fatty cellules oozes out more readily, which renders the hair of the Angora goat softer and more flexible, and gives it the lustre of silk."

M. Brandt omits to mention that the long ringlets cover the hair, properly called, which is rough and short and lies sparingly upon the skin.

The dimensions of the specimen examined by Mr. Brandt are given by him as follows:¹

	<i>Ft.</i>	<i>in</i>	<i>l.</i>
From the point of the snout to the root of the tail.....	5	4	2
Length of head.....	11	9	
From the point of the snout to the eye.....	5	1	
From the eye to the ear.....	2	5	
From the eye to the horns.....	1	9	
Length of ear.....	6	0	
Length of horns in direct diameter.....	1	2	0
Length of horns following the curvature.....	1	6	6
Distance between horns taken at their roots.....	2	1	
Distances between their terminal points.....	1	9	9
Width of horns at their roots.....	2	1	
Length of tail, including the hair.....	9	9	
Height of anterior part of the body.....	2	2	4
Height of posterior part of the body.....	2	2	2

The point of inquiry most strictly pertinent to the objects of this society, and one at the same time eminently practical, as indicating the laws which govern the reproduction of this animal, thus illustrating the relations of pure science with utilitarian ends, is the determination of the specific source of the Angora goat.

The popular opinion as to the origin of this species is founded upon the authority of Cuvier, who mentions but three species of the genus *Capra*—*Capra agagrus*, *Capra ibex*, *Capra caucasica*. He says: "*Capra agagrus* appears to be the stock of all the varieties of domestic goat;" adding that they vary infinitely in size and color, in the length and fineness of the hair, in the size of the horns, and even in the number; the Angora goats of Cappadocia having the largest and most silky hair.²

The more recent researches of zoölogists have greatly developed the knowledge of this genus. Instead of three only there are now recognized nine species of wild goats, which are divided into two groups based upon the form of the horns:

- | | | |
|---|---|---|
| 1. Group with horns flat in front, having a hori- | { | <i>Capra ibex</i> .
<i>Capra hispanica</i> .
<i>Capra pyrenaica</i> . |
|---|---|---|

¹ Bulletin de la Société Impériale d'Acclimatation, t. ii., pp. 316-18.

² Animal Kingdom, McMurtrie's Translation, vol. i., p. 198.

In fact, none of the more modern systematic writers place it in the genus *Capra*, or, indeed, in the ovine group. The mere general resemblance, externally, to a goat is a matter of little consequence; indeed, its body is much more like that of a merino sheep. The soft, silvery, under hairs are very different from those of a goat, as well as the jet black horns, which are without any ridges, and smooth and highly polished at the extremities.”¹

The more recent investigations have shown that the animals referred to, and figured by G. Cuvier and F. Cuvier as types of the *Capra ægagrus* or Paseng, and said to occur both in Persia and on the Alps, were domestic goats which had become wild. Later researches have determined the true characteristic of *Capra ægagrus*, a species formed by Pallas from a cranium only, received by Gmelin from the mountains of the north of Persia, and have shown that naturalists had adopted this species as the source of the domestic goat without resting the assertion upon any proof. The comparison by M. Brandt in 1848 of a collection of skulls and horns obtained by M. Tehilhatcheff in the Cappadocian Taurus, with the original cranium which served Pallas for the type of his species, has enabled that naturalist, for the first time, to demonstrate positively the derivation of our domestic goat from *Capra ægagrus*. M. Brandt asserts that it results from his labors that this species “is incontestably and exclusively the source of the domestic goat of Europe,” and gives the following arguments in support of this assertion:

1. “The *Capra ægagrus* has all the exterior forms and all the proportions of the domestic goat.”

2. “It resembles it very much in the general as well as local distribution of its colors.”

3. “It approaches the domestic goat more than any other species in the configuration of its horns, a configuration which plays so important a part in the characteristics of the wild species.”

4. “It presents the same agreement with the domestic goat in respect to the cranium. Finally, it is found in the mountains of the countries, especially Mesopotamia, inhabited by the people of antiquity, (the Israelites, Assyrians, &c.,) which have furnished the most ancient information respecting the raising of the goat.”²

The establishment of the perfect identity of the domestic goat with a wild species is a negative argument of much force for the exclusion from the same source of an animal so widely differing as the Angora goat. A positive argument of equal weight is the recent observation that the Angora goat more nearly resembles another wild species lately discovered. This species, the *Capra Falconeri*, is found upon all the mountains of Little Thibet, and upon the high mountains situated between the Indus, the Badukshan, and the Indo Kusch. It resembles greatly the domestic

¹ Vol. vii, p. 672.

² Considerations sur la *Capra ægagrus* de Pallas, souche de la Chèvre domestique, par. J. F. Brandt. Bulletin supr. cit., t. ii, p. 565.

goat, from which it differs principally in its magnificent horns, which, near together at the base, are at first arched backwards, and then turn in a spiral inwards, and then over again outwards. They are strongly compressed, triangular and free from knots; their internal face, at first plane, is rounded higher up, whilst their external face is everywhere convex. Although there does not appear to be a development of fleece in this wild species corresponding to that of the Angora goat, M. Sacc, professor in the faculty of sciences at Neuchatel, who has made a special study of the goats, does not hesitate to declare that "all the characters of this species seem to indicate that it is the source of the beautiful and precious Angora goat, whose horns are spirally turned like those of Falconer's goat." M. Brandt intimates that the domestication of other wild species than *Capra agagrus* and perhaps the *Capra Falconeri* had produced the Angora goat. Geoffrey St. Hilaire, the highest authority upon the origin of domestic animals, refers to the opinions of M. Sacc and M. Brandt without dissent, thus: "He (M. Brandt) is led especially to see in the Angora goat, produced, according to Pallas, by the cross of the sheep with the goat, an issue of the *Capra Falconeri*; this opinion is also admitted by our learned confrere, M. Sacc."¹

The hypothesis that the Angora goat is descended from Falconer's goat is rendered probable by the diffusion of the former around the mountains of Thibet, where Falconer's goat abounds, and even beyond the central plains of Asia from Armenia to Chinese Tartary, where its wool is manufactured, or exported in a natural state by the port of Shanghae. Angora wool, or mohair, was exhibited at the London Exhibition of 1862 among the Russian products, as proceeding from the country of the Kal-mucks of the Don, situated between the Black and Caspian seas. This species is thus seen to be diffused, although it may be sparingly, over the whole surface of Asia.

That this goat is at present more abundant in the country about Angora in Asia Minor, near the habitat of the *Capra agagrus* and distant many thousand miles from Thibet, may seem opposed to its derivation from the Thibetian species. The learned memoir of the Russian traveller, M. Tchihatcheff,² establishes beyond question the comparatively recent introduction of the Angora goat into Asia Minor. He has shown that among the countries of classic antiquity there is no one which the ancient writers have mentioned more frequently and under more varied aspects than Asia Minor, because this country was not only one of the foci of the Greek civilization, but also the native country of a great number of the most celebrated writers of antiquity, such as Herodotus, Homer, Strabo, Dion of Halicarnassus, Galen, &c. Hence in all that concerns the natural history of Asia Minor, the writings of these authors have an especial interest, while their silence has the value of a negative argument. Referring to the writings anterior to the classic period, we

¹ Sur les origines des animaux domestiques. Bulletin supr. cit., t. vi, p. 503.

² Considerations sur la chèvre d'Angora. Bulletin supr. cit., t. ii, p. 411.

find in the most ancient and venerable of historic monuments, the Bible, that the goat is frequently mentioned among the domestic animals which constituted the riches of the first patriarchs. Yet there is nothing in these notices which leads us to suppose that they were possessed of a race with fine and white wool. The beautiful comparison in the Song of Solomon which might seem to suggest the existence of a choice race of these animals, "Thy hair is as a flock of goats that appear from Mount Gilead," taken in connection with the verse following, "Thy teeth are like a flock of sheep that are shorn, which came up from the washing," would seem to intimate that the color was referred to by the poet as the point of resemblance; while the first comparison, to be flattering to youthful beauty, must imply that the color was black and not white.

Coming down to the Greek authors—Homer and Hesiod, though frequently mentioning the goat as a domestic animal, make no allusion to any particular race. Ælian, referring to the goats of Lycia and the practice of shearing them like sheep, says that the wool is used for cords and cables. Appian mentions the stuffs known under the name of *Kilikia* from Cilicia, the ancient name of the country in which Angora is situated, as a means of protection against projectiles; implying that the tissues of the goats of Cilicia were not distinguished for their fineness. Virgil gives the wool of the goat no other destination than to serve for the necessities of the camp and for the use of poor sailors:

"Usum in castrorum et miseris velamina nautis."

Columella, the great writer on Roman agriculture, quotes this line of Virgil as applicable to the covering of goats, and while tracing the qualities which a perfect animal should possess, excludes all resemblance to the Angora goat by demanding that the hair should be black. Strabo, born in the town of Amasia, very near the present domain of the Angora goat, makes no mention of goats of that country distinguished for their fleeces, although he remarks upon the different races of fine woolled sheep found in many places in Asia Minor. The author whom I am following observes that the most careful research among the Byzantine writers, after the Roman possessions became the patrimony of a barbarous people, has not afforded the least indication of a fine and white woolled goat. It was not until the year 1555 that the Angora goat was distinctly made known through the Father Belon, who had travelled in Asia Minor, by a brief but sufficiently characteristic description. The silence of the classic authors in respect to any goat with fine and white fleece would seem to place it beyond doubt that the progenitors of this animal were introduced into Asia Minor at a comparatively recent period, when the country was invaded by barbarous and pastoral races, either Turks or Arabs. M. Tchihatcheff observes that the Arabs have never formed stable establishments in Asia Minor, while the Turkish race is the only one among the modern invaders of that country which came in search of a permanent home and has preferred it unto this day. He shows that two branches of the Turkish race, the Suldjeks and the Oghus, suc-

cessively installed themselves in Asia Minor in the eleventh and thirteenth centuries, taking possession of the precise region in which Angora is included, and which their descendants still occupy. Immediately previous to their immigration they had occupied the vast plains of Khorasan and Bokara, and still more anciently, according to the most celebrated orientalists and geographers, the country on the southern borders of Siberia and the mountains of the Altai chain. It appears thus to be not improbable that a race of animals, originating in Central Asia, whose representative still exists in the *Capra Falconeri*, should have been carried by the migration of pastoral tribes to the region in which they are now found in the modified form of the Angora goat. This hypothesis is supported by the statement of the President de la Tour d'Aigues, probably derived from the Turkish shepherds who accompanied the flock introduced by him into Europe in 1787, that "there is a constant tradition that the goats of Angora did not originate in that country, but were derived from Central Asia."¹

Although the origin of the Angora goat from Falconer's goat is not demonstrated by proofs as positive as those which support the derivation of the common goat from *Capra aegagrus*, they are not less positive than those which formerly led all naturalists to attribute the paternity of the common goat to that species. The absolute knowledge of the progenitor of the Angora goat is of less practical importance than the demonstration of a specific difference between the two races. That the Angora goat constitutes a particular race, and is not due to the same origin as the common goat, seems established by the following considerations:

1. There is an essential difference in the horns of the two races, those of the Angora race being twisted spirally, a configuration wholly wanting in the common race, the form of the horns being recognized by modern systematic writers as the basis of the classification of the family *Caricornia*, or ruminants with horns permanent, hollow, and enclosing a piece of the frontal bone.

2. The mammillary organs are hemispherical, while they are elongated in the common species.

3. The very long woolly hair, hanging in corkscrew ringlets, fine, white and lustrous as silk, covering the short and harsh hair properly so called, which lies upon the skin, is in striking contrast with the short and coarser external hair of the common goat with its finer interior hair or down.

4. The cry, wholly different from that of the common goat, resembles that of sheep.

5. The milk is more fatty; the odor of the male less strong and disagreeable.

6. The Angora, like the common goat, is fattened as readily as the sheep, and the flesh is exceedingly palatable.

7. The specific difference is finally established by the character of the crosses, a point to be referred to hereafter with more detail.

¹ Sacc, *Essai sur les Chèvres*. Bulletin *supr. cit.*, t. iv, p. 6.

The theory of the difference of species in these two races is not invalidated by the fertility of the products of their crosses; such fertility having been observed in the mixed offspring of the more widely separated species, the horse and the ass. In this case it is well established that the he mule can generate and the she mule produce, such cases occurring in Spain and Italy, and more frequently in the West Indies and New Holland.¹

The practical deduction to be drawn from the separation of the two species is thus clearly stated by M. Sacc: "There is then no utility in creating flocks of the Angora for crossing with the ordinary goat. We must limit ourselves to preserving the species in entire purity and devote ourselves to improving the race by itself, as has been done with the justly celebrated merinos of Rambouillet."² A leading object of this paper is to enforce the opinion of this sagacious and practical naturalist.

Upon the introduction of the Angora goat into France in 1787, and more recently in 1855, the opinion was generally entertained that the principal benefit to be derived from the new race would result from the amelioration of the products of the common species. This opinion unfortunately prevails in this country. It is sanctioned by all the agricultural notices or essays which have been published respecting the new race, and is naturally fostered by importers and breeders to enhance the selling price of bucks.

One of the earliest papers descriptive of this species which appeared in this country was published in the Patent Office Agricultural Report for 1857,³ it being the abstract of a report upon the Cashmere goats, as they were called, in the possession of Mr. Richard Peters, of Atlanta, Georgia, written by the well-known naturalist, Dr. John Bachman, of Charleston, South Carolina. This excellent naturalist, repeating the views at that time entertained, says: "The varieties of goats are equally numerous and equally varied in different countries. They are all of one species, the varieties mixing and multiplying into each other *ad infinitum*. They all claim as their origin the common goat, *Capra hircus*, which it is admitted by nearly all reliable naturalists derives its parentage from the wild goat, *Capra agagrus*, that still exists on the European Alps." After referring to the diversity of color, aspect, and form, seen in the goats of Hindostan, Chinese Tartary, and Thibet, he says: "In a word, they are all of one species, but under many varieties; breeds have become permanent, and some are infinitely more valuable than others." He gives the results of breeding the Angora with the common goat as shown in the flocks of Mr. Peters in the following language: "Familiar as we have been through a long life with the changes produced by crosses among varieties of domestic animals and poultry, there is one trait in these goats which is more strongly developed than in any other variety that we have ever

¹ Lyell's Principles of Geology, vol ii, p. 423.

² Bull. supr. cit., t. v., p. 571.

³ P. 56.

known. We allude to the facility with which the young of the cross between the male of the Asiatic goat and the female of the common goat assume all the characteristics of the former. It is exceedingly difficult to change a breed that has become permanent in any of our domestic varieties, whether it be that of horses, cattle, sheep, or hogs, into another variety by aid of the male of the latter. There is a tendency to run back into their original varieties. Hence the objection to mixed breeds. But in the progeny of these Asiatic and common goats, nine-tenths of them exhibit the strongest tendency to adopt the characteristics of the male, and to elevate themselves into the higher and nobler grade, as if ashamed of their coarse, dingy hair, and musky aromatics, and desirous of washing out the odorous perfume and putting on the white livery of the more respectable race." Speaking of the Angora goat, Mr. Israel S. Diehl, who has contributed a paper upon it of much research, and valuable for many original observations, says:¹ "This goat, though described as the *Capra Angorensis*, is only an improved variety of the *Capra hircus*, or common domestic goat." He refers to numerous State agricultural societies and scientific and practical men to show the value of the Angora goat and its fleece, "and the facility with which it can be crossed and bred with the common goat, by which a flock can be readily raised and increased," adding, "almost all the progeny exhibit the strongest tendencies to the higher and nobler grades by assimilating themselves to the male and putting on the white livery of the more respectable, honored, and valued race." These views, widely circulated through the government agricultural reports, have been accepted without question, and the efforts of breeders in this country have been largely wasted in vain efforts to produce crosses which would have all the value of the pure race.

To judge of the value and feasibility of such attempts we must bear distinctly in view the precise economical result to be sought for. It is obviously not primarily to obtain a breed of goats which shall be fit for the butcher. Neither is it to secure a breed which will furnish a merely tolerable fleece which would be simply a substitute for the wool of the sheep. The object is to appropriate a race of animals which shall produce a textile material adapted for certain defined purposes in the arts as distinct as silk, noble Saxony wool, or sea-island cotton; a material which is substitute for nothing else known, and has originated its own fabrics. The introduction of a race which fails to give this peculiar fibre would be no real acquisition, however amusing to the breeder and interesting to the physiologist the experiments in crossing might be.²

¹ Report of the Department of Agriculture for 1863, p. 216.

² The conviction is extending among intelligent wool growers in this country of the importance of preserving the varieties of woolly fibre, each in its own character, purity, and excellence, and free from that "mongrel type which will *do* for everything, but is *not desirable* for anything." At a meeting of the Ohio Wool Growers' Convention, January 7, 1867, "Mr. R. M. Montgomery moved that the true course in breeding sheep is to keep breeds entirely distinct and to endeavor to produce the best clothing of the best combing wools, which proposition was unanimously agreed to."—U. S. Economist, January 25, 1868.

Laying aside the statements given in the agricultural reports, as of little value as testimony, because there is no matter in which even skilful flock breeders are so liable to be deceived as in the character and adaptation of their fleeces, and because there is no evidence that the products of the crosses referred to have ever been subjected to the only conclusive test, that of spinning, let us consider the feasibility of producing the typical fleece of the Angora goat by means of crosses, by reference to admitted physiological principles, and the results in analogous cases. The illustrious naturalist, M. de Quatrefages, who has recently discussed, in his lectures at the Muséum d'Histoire Naturelle, and in the *Revue des Deux Mondes*,¹ the principles which govern the formation of races, remarks that "there is one law in crossing which is constantly verified: each of the two authors tends to transmit to the products at the same time all its qualities good or bad." This tendency he admits is modified by the predominance, in one or the other, of the power of transmissibility. "When this power is equal in the two parents the product will have an equal mixture of the qualities of the parents; there will be a predominance of the qualities of one where this power of transmissibility is unequal. The inequality of the power of transmissibility appears to be much greater when the races are nearest each other, for sometimes the crossing between such races gives a product which seems to belong entirely to one of the two."² He observes that it follows from these principles that nothing could be more irrational than to take animals of the half blood as regenerators to ameliorate a race; for not possessing completely the qualities which we seek, and having preserved a part of the bad which we wish to shun, they transmit a mixture of one, and besides, as they are necessarily of a formation more recent than the race to be regenerated, it will be the last one which will impress itself, if not upon the first, at least upon successive generations. These views are confirmed by the recent observations of Professor Agassiz in Brazil on the effects of crosses of races of men. He observes that the principal result at which he has arrived from the study of the mixture of human races in the region of Brazil is that "races bear themselves towards each other as all distinct species; that is to say, that the hybrids which spring from the crossing of men of different races are always a mixture of the two primitive types and never the simple reproduction of the characters of one or the other progenitor." It is also remarked by the same high authority, that, "however naturalists may differ respecting the origin of species, there is at least one point in which they agree, namely, that the offspring from two so-called different species is a being intermediate between them, showing the peculiar features of both parents, but resembling neither so closely as to be mistaken for a pure representative of the one or other."³

¹ *Vide* *Revue des Deux Mondes*, December 15, 1860, to April 14, 1861.

² *Amelioration de l'espèce chevaline*, Bull. supr. cit., t. viii, 1861, p. 257.

³ *A Journey in Brazil*, by Professor and Mrs. L. Agassiz, pp. 296 and 338.

The views of the eminent physiologists above quoted give no support to the popular fallacy into which Dr. Bachman and Mr. Diehl seem to have fallen, that the male animal possesses the greater power of transmitting blood to his progeny. Dr. Randall, in the chapter upon the principles of breeding in his "Practical Shepherd," while admitting that the ram much oftener gives the leading characteristics of form, attributes the greater power of the ram to the superiority of blood and superiority of individual vigor, as the ram is generally "higher bred" than the ewes, even in full blood flocks.¹

If it be true as a physiological principle that the parents in widely separated races tend equally to transmit all their qualities, what hope is there of obtaining a valuable lanigerous animal from the crosses of goats so widely separated as to belong to different species; especially when the heavy coating of one is absolutely worthless, and nothing short of the peculiar qualities found in the other is worth seeking for? All analogy teaches that it is vain to expect to form a permanent race of any value from the crosses of such widely separated races. Dr. Randall declares that "all attempts to form permanent intermediate varieties of value by crosses between the merino and any family of the mutton sheep with the view of combining the special excellencies of each have ended in utter failure."² The German breeders say that it is impossible to transform, by crossing, the common sheep into merinos. Even after nine generations the common type reappears as soon as the use of merino rams of the pure blood has ceased.³ It is for this reason that the Germans refuse to the highest bred grade any other designation than improved half breeds.⁴

The constant use of regenerators of pure blooded Angoras, if they could be procured, which would soon be impossible, from domestic sources, if the system of crossing should be persisted in, would be of little avail. In the Asiatic goat we have a perfect standard, as in the Arabian horse. Mr. Youatt says of the English races of the horse descended from the Godolphin Arabian, or the Darley Arabian and the blood mares of Charles I, "where one drop of common blood has mingled with the pure stream, it has been immediately detected in the inferiority of form and deficiency of bottom."⁵ So, we may infer, will a drop of blood of the common goat detract from the lustre and fineness of fibre found in the pure Asiatic race.

The elaborate article of Mr. Fleischman on German fine wool husbandry⁶ gives the results of constantly regenerating by the pure merino ram, the cross from the pure merino and common country sheep. At the fourth generation the fleece consists of 25 per cent. *prima*, 50 per cent. *secunda*, and 25 per cent. *tertia* wool. The nature of the wool is

¹ Pp. 110, 111.

² The Practical Shepherd, p. 125.

³ Sacc. Bull. sup. cit., t. v, p. 571.

⁴ Practical Shepherd, p. 127.

⁵ Youatt on the Horse.

⁶ Patent Office Report, 1847, p. 253.

still coarse. There are about 18,000 wool hairs in a square inch. In the tenth generation the fine wool predominates. A fleece yields from 60 to 70 per cent. *prima*, 20 to 25 per cent. *secunda*, and 10 to 15 per cent. *tertia* wool. In the twentieth generation the fleece, by regular crossing and careful management, has 20 per cent. *electa*, 50 per cent. *prima*, 20 per cent. *secunda*, and 10 per cent. *tertia* wool. There will yet be sometimes found *stickel* or coarse hair. At this period 27,000 wool hairs grow upon a square inch. Thus even at the twentieth generation, with the constant use of regenerators of the pure blood, the wool falls short of the fineness of the original or perfectly pure blooded animal, which has from 40,000 to 48,000 wool hairs on a square inch. These facts show how slow is the approach to fineness of fibre even in crosses of animals descended from a remote though common ancestor.

Proceeding from analogy to direct evidence as to the results of breeding the race under consideration by means of crossing with the common species, no person in Europe has examined the Angora goat so thoroughly and for so long a period as M. de la Tour d'Aigues, president of the Royal Society of Agriculture of France, who, in 1787, introduced some hundreds of these goats into Europe under the care of Turkish shepherds, and established them upon the low Alps, where they greatly prospered. He affirms that even after the sixteenth generation the hair of the crosses obtained by crossing the Angora buck with females of the common goat remained hair, and although it was elongated it could not be spun.¹ "This species is," he says, "constant; and although they procreate with our goats we can never hope to multiply them by crossing the races, because the vice of the mother is never effaced. If some individuals approach, more or less, the race of the sire, the hair will always be shorter and too coarse to be worked."² The testimony of this official head of the agriculture of France is of the highest value, not only because his position led him to seek the utmost advantage from the introduction of a new race, but because an elaborate memoir published by him shows that he had made thorough experiments in spinning and manufacturing the products of his fleeces, for which he gives minute directions.

The observations of M. Brandt show that the thickness of the hair of the pure Angora goat is from a third to a half that of the common goat. This fineness of fibre is an essential spinning quality. The fibre of this species is always prepared and spun in the form of worsted of long wool, that is, the fibre is not carded or subjected to a process by which the fibres are placed in every possible direction in relation to each other, adhering by their serratures, but are drawn out by combing so that they may be straight and parallel, the ends of the fibre being covered in the process of spinning, so that the yarns are smooth and lustrous. The fibres being extremely slippery they will not adhere in spinning unless they have the requisite fineness to permit many parallel fibres to be

¹ Saac Bull. supr. cit., t. v, p. 570.

² Saac Bull. supra. cit., t. iv, p. 8.

united in a yarn of a given number. When the fibres are too large they require to be mixed with combing wool to "carry" the fibre, as it is technically called, which diminishes the lustre of the fabric. Manufacturers of worsted, who have had large experience in spinning the mohair of Asia and this country, inform me that the best mohair can be spun into yarns of the number 42, while others are with difficulty spun into yarns numbered from 10 to 16. Fibre of the latter quality is of no more value than the most ordinary combing wool, except for a few exceptional purposes, to be hereafter referred to. Lots of so-called Angora wool, doubtless the products of recent crosses, offered in the market the present season, could be used only for carpet filling, the lowest use of woolly fibre.

Although the facts and reasoning given above leave no doubt upon my own mind that the breeding from crossings of the common goat of this country should be abandoned, it is proper that I should state that hopes are still entertained in France of good results from breeding with the domestic goats of that country. M. Richard, of Cantal, in a report made in 1862 upon the animals deposited by the Society of Acclimatation at the farm of Souliard, in the Cantal, says: "Crosses produced from the Angora and the ordinary goats of Auvergne have given products, which at the second generation much resemble those of pure blood; and if the society should continue its experiments upon this subject, I think it will obtain some happy results. Nevertheless, to settle the opinion upon this point, it would be useful to study this practical question wherever the Angora goats have been deposited."¹ The most that can be made of the opinion so cautiously expressed is that the system of crossing is still regarded in France as a proper subject of experiment.

CULTURE IN THE REGION OF ANGORA.

The culture of this species in the country of its greatest development next demands attention. Ample information upon this point is furnished by scientific travellers. The celebrated academician Tournefort, the master in botany of the illustrious Linnaeus, was the first to shed full light upon the ancient magnificence of Ancyra, the site of the present Angora, mentioned by Livy among the illustrious cities of the east. He refers to its most ancient people as having made even the kings of Syria their tributaries, while its later inhabitants were the principal Galatians, whom the Apostle Paul honored with an epistle. He describes its monument to Augustus, the most splendid in all Asia, upon which was inscribed in pure latin the life of the emperor, its streets abounding with pillars and old marbles mingled with porphyries and jaspers, its walls built up of ruins of architraves, bases and capitals, and its tombs covered with Greek and Latin inscriptions, all attesting that this was one of the centres of the Roman civilization, and making more significant the silence of contemporary authors before alluded to. But more interesting than the monuments of past splendors is the mention, first given

¹ Bulletin, *supr. cit.*, t. ix, p. 8.

with any detail by this traveller, of the contribution to modern civilization made by the barbarians from Central Asia. I transcribe his language:

"They breed the finest goats in the world in the champaign of Angora. They are of a dazzling white, and their hair, which is fine as silk, naturally curled in locks of eight or nine inches long, is worked up into the finest stuffs, especially camlet. But they do not suffer these fleeces to be exported from this place, because the people of the country gain their livelihood thereby. * * * However it be, these fine goats are to be seen only within four or five days' journey of Angora and Beibazar. Their young degenerate if they are carried further. The thread made of this goat's hair is sold for from four livres to 12 or 15 livres the *ocque*. Some is sold for twenty and five-and-twenty crowns the *ocque*, but that is only made up into camlet for the use of the Sultan's seraglio. The workmen of Angora use this thread of goat's hair without any mixture, whereas at Brussels they are obliged to mix thread made of wool, for what reason I know not. In England they use up this hair in their periwigs, but it cannot be spun. * * * All this country is dry and bare except the orchards. The goats eat nothing except the young shoots of herbs, and perhaps it is this which, as Brusbequis observes, contributes to the consummation of the beauty of their fleece, which is lost when they change their climate and pasture."¹

Interesting statements in relation to the culture of this species at Angora are given by Captain Conelly, an English traveller, in a paper read before the Asiatic Society, which I deem it unnecessary to repeat, as they are generally accessible in Mr. Southey's work on wool.² The most recent information is that given by the Russian traveller before quoted, who devoted five years to the study of natural history in Asia Minor, and M. Boulier (Pharmacien Aide Major) in a report of a mission to Asia Minor presented to the French minister of war.³ The region marked out by the former of these scientific travellers, as the peculiar domain of the Angora goat, is situated between 39° 20' and 41° 30' north latitude, and between 33° 20' and 35° longitude east of Paris, a surface of about 2,350 metric leagues square, equivalent to about a forty-fourth part of the surface of the peninsula of Asia Minor, and about the same fraction of the area of France. This country is more or less mountainous and furrowed by deep valleys, its mean altitude being estimated at 1,200 metres; while the more elevated masses are generally shaded with fine forests, the plateaus, which form a large part of the country, are very little wooded. The absence of trees, bushes, and arborescent plants gives the country the aspect of immense steppes. This nudity permits the first heats of the spring to dry up the little humidity which the earth

¹ A Voyage into the Levant. By M. Tournefort, Chief Botanist to the French King.

² Southey on Colonial Wools, p. 322 *et seq.*

³ Vide Considérations sur la chèvre d'Angora, par M. P. de Tchihatcheff, Bull. supr. cit., t. xi, p. 305. Sur la chèvre d'Angora, par M. Boulier, Pharmacien Aide Major. Bull. supr. cit., t. xi, p. 557.

has acquired in winter. The climate is excessive, the winters being very cold, and the summers exceedingly hot. The country is covered with snow in winter, the rain and snow being very frequent, the thermometer in the neighborhood of Angora frequently descending to -12° -15° -18° of the Centigrade thermometer, corresponding to 10.6° , 5° , and zero Fahrenheit.

The cold season continues, however, only three or four months. During the rest of the year the temperature is very hot, particularly in the valleys, while the fine days continue almost without interruption; abundant pasturage is found for the white goats only after the frosts and snows, when the first warm rains revive the vegetation. This time is of short duration, and the stimulus given by a copious and succulent nourishment is exerted wholly in developing the fleeces in length. The shearing, which takes place in April, is hardly concluded when the vegetation called forth by the warm spring is arrested, and receives no moisture from the dews, persons lying at night in the open air finding in the morning no humidity upon their garments. This dryness, however, gives to the vegetation which flourishes, the only aliment to flocks during summer, an aromatic character which makes it peculiarly digestible and stimulating.

The mineralogical character of the rocks which underlie the country is generally feldspathic, the trachytic and serpentine rocks abounding. No peculiar mineralogical elements appear to be essential to the successful culture of this species, as M. Boulrier observes that there is not the least sign of degeneracy in the fleeces of flocks grown upon calcareous or gypseous soils. The localization of this species in certain districts within the general domain assigned to it is quite remarkable, and appears to be mainly determined by the altitude of the country, the flocks of the pure race being rarely distributed upon the most elevated districts, in the deep valleys or the neighborhood of the forests. This localization is doubtless encouraged by the native proprietors, who unanimously assert that this goat cannot be transported from the place where it is born to a neighboring village without suffering a deterioration of fleece. Even the intelligent travellers above referred to seem to partake of this opinion. Direct observations, however, in Europe and elsewhere, have shown that this apparent deterioration is only the effect of age, and not due to a change of place and climate or food. The finest fleece is found upon animals a year old, which is worth eleven francs the kilogram; although somewhat less fine in the second year, it is quite good at the end of the fourth year, when it is worth six francs the kilogram. At the end of the sixth year the fleece is positively bad, and at this period the animals are usually killed, their natural life being only nine or ten years.

All authors agree that these animals, although able to resist both heat and cold except immediately after shearing, when they are liable to be destroyed by moderate depression of temperature, cannot withstand

much humidity, either in their pastures or folds. In a moist atmosphere they are especially subject to maladies of the respiratory organs, or a kind of pleuro-pneumonia. In severe winters, while the common goat of the country is unaffected, the mortality among the goats of the pure race is frightful. This is due largely to their confinement, when the temperature is 15° Centigrade, in very bad stables completely closed and unventilated, and to their nourishment upon fodder imperfectly dried, a very little barley only being given when the snow falls. The delicacy and lymphatic temperament of the white Angoras, which seem to be inherent to this race, appear to be closely related to their color. Some physiologists see in the color and delicacy of this animal the evidence of an imperfect albinism. In the very interesting discussions of the Board of Agriculture of Massachusetts in 1867 many curious facts were stated, illustrating the relation of a white color in animals with certain diseases and deficiencies; for instance, that white horses are subject to diseases to which black or red horses are not. Prof. Agassiz expressed the opinion that change of color in animals must be the result of some general change in the system, and if it is not shown in the eyes it will be shown in something else, the light color being a kind of bleaching of those darker tints which are connected with the qualities of the blood, indicating a certain feebleness of the system." These views are peculiarly interesting when taken in connection with the facts stated by M. Boulier as to the manner in which the losses above referred to are repaired. The fact had already been stated by M. Tchihatcheff, that when the losses are very considerable, the people of the country repair them by crossing the Angora with the common goats, and that the purity of the race is regained in the third generation. This statement was regarded in France as conclusive as to the expediency of crossing with the common goats of France, until the statements which follow were published. M. Boulier shows that the goats referred to as common in Asia are of the same species as those of the pure Angora race, from which they differ only in their color and size. The variety which is spread everywhere in Asia Minor, upon all soils and at all altitudes, is the black or Kurd race. The variety confined to the narrow limit is the *white* race. "The one and the other," he says, "have long fleeces. Their general forms resemble each other. The black goat is only of a size about a fifth larger than the white goat. The weight of the fleece of the black race varies between three and four ocques (3 kil. 750 to 5 kil.) The hair, black, straight, and without undulation, reaches a length of 0.27 m. * * * The length of the locks of the white race reach 0.25 m., and the weight of the best fleece two ocques (2 kil. 500.)" M. Boulier cites two examples to show that the introduction of the white female goats into the country where they have not previously existed is not regarded by the natives as the most simple and rapid means of acquiring the more precious race. "Seventy years ago, at Zehiftela Gentchibe Yallaci, the natives possessed no white goats. Since that period they have crossed

the black female goats of the village with the buck of the white race, and at present there are not less than eight thousand goats of the latter race upon the territory of that district. We have examined the flocks, and the fleeces are in no respect inferior to any of those which we have seen elsewhere. It is now established in respect to these new generations that after three years of experience the newly crossed race has not degenerated; it is distinctly established, since for a long time the regenerators are taken from the flocks themselves. At Sidi Ghazi the crossing by the same procedure has been commenced within only six years. The flocks are magnificent." The effects of the crossing in the successive generations are thus detailed:

"1. The cross of a black female goat with a white buck will present a fleece marbled with a yellow color upon an impure white foundation. The flanks, the shoulders, and the head will preserve more particularly the marks of the color of the mother; the fineness of the fleece will be sensibly ameliorated.

"2. The cross of this first product with a white buck will cause all the dark tints to disappear. The fleece will become white. The shoulders and the flanks will be covered with wavy ringlets; but the whole line of the back and the forehead will remain furnished with coarse, straight hairs.

"3. On coupling this new cross always with a buck of the pure race we shall obtain a greater fineness in the long ringlets of the flanks and shoulders; the dorso-lumbar portion of the vertebral column will no longer retain coarse hairs, which will remain still on the upper part of the neck and forehead.

"4. A fourth cross, carried on with the same precautions as before, will fix a stamp of purity to the product; the coarse hairs will have disappeared on the forehead and neck.

"5. The consecutive crossings will render more stable the modifications already formed, and already after the fifth generation the individuals will be able to reproduce as if they were of the pure blood."¹

An infallible proof of fineness not mentioned by M. Boulier is insisted upon by other writers, viz., the curling of the wool, which is observed upon the young individuals only when they are of the pure blood, so that all the young bucks are rejected from the flocks with the utmost care, as not being of the pure race, whose wool is not curled.

It is not to be denied that further observations are greatly to be desired in confirmation of the observations of M. Boulier. They are, however, referred to by M. Sacc as both "skilful and conscientious,"

¹ Bull. supr. cit., t. v, p. 168. The facts stated by M. Boulier may seem inconsistent with the views elsewhere presented in this article as to the slowness of improvement by crossing. The identity of species in the black and white race is not settled by this naturalist. The power of deviation within wide limits may be a characteristic of this species in domestication; and these facts, to use the language of Professor Agassiz in relation to deviations of species, may "only point out the range of flexibility in types which in their essence are invariable." (A Journey in Brazil, p. 42.)

and are relied upon by the latter naturalist as establishing the identity of the species of the black Kurd and white Angora race, and they are quoted with approbation by M. Bemis, principal veterinary surgeon of the army of Africa. This identity seems confirmed by the observations of M. Diehl, who has personally visited Angora. "There is also a second or other variety of Angora or shawl-wool goat, besides those generally described. This goat has an unchanging outer cover of long coarse hair, between the roots of which comes in winter an under-coat of downy wool that is naturally thrown off in spring or is carefully combed out for use. A remarkably fine species of this breed exists throughout the area to which the white-haired goat is limited."

The number of goats of the white race grown in the district of Angora is estimated by M. Sacc and others at 300,000, and the product in wool (called tiftik by the natives, and mohair in England) at 2,000,000 pounds. The English tables of Turkish exports make the product in 1867 a little over 4,000,000 pounds. Formerly the wools of Angora were wholly spun or woven in place, and were exported in the form of yarns or camlets, of which the city of Angora sold, in 1844, 35,000 pieces to Europe. The exportation of the wool was prohibited, through the same wise policy which enabled England, by its monopoly of the combing wools, to build up its stupendous worsted manufacture. Some 1,200 looms were employed. The natives displayed great skill in making gloves, hosiery, and camlets for exportation, and summer robes of great beauty for the Turkish grandees.¹ The town flourished, and the whole population was busy and happy in the pursuit of their beautiful industry. After the Greek revolution the Turkish government was tempted by British influence to admit, free of duty, the products of European machinery, and to permit the export of the raw tiftik. This fatal step was the death-blow of the town of Angora. The whole product, with the exception of 20,000 pounds only, still worked up at home, was exported to England. The looms employed were reduced from 1,200 to not more than 50; and the town, although having at its command the raw material for a most important and characteristic manufacture, offers in its sad decline another monument of the desolating influence of that system which would make the raw material of every country tributary to the one great workshop of the world.

RESULTS OF EXPERIMENTS IN ACCLIMATION IN EUROPE AND THE UNITED STATES.

The attention of philanthropic agriculturists in Europe was drawn to this race in the last century. The first attempt to appropriate the race in Europe was made by the Spanish government, which imported a flock in 1765, which has disappeared. Next followed the importation of the President Tour d'Aigues, who introduced some hundred upon the Low Alps in 1787. This experiment of acclimation appears to have been

¹Southey on Colonial Wools.

wholly successful, as this eminent agriculturist declares that although his flocks received no special care, they were constantly preserved in good health, and accommodated themselves as well to the climate as to the pasturage. "I can attest," he says, "that nothing is easier than to raise and nourish the species; they are led to the pastures with the sheep, and are fed like them in winter." Towards the end of the last century Louis XVI imported a flock of Angoras to Rambouillet; but this, as well as the flocks of Tour d'Aigues, disappeared in consequence of the revolution. The best results were obtained in Spain from the importation of a flock of 100 in 1830 by the King of Spain. M. Graells reports that this flock was transported to the mountains of the Escorial, where, he says, "I had occasion to see them for the first time in 1848, that is to say, 18 years after their entry into Castile. At this time the flock was composed of 200 individuals, almost all white. The males had a magnificent fleece. The shepherds told me that all the primitive individuals had disappeared, and that those which lived were born in the country, and that they could be regarded as naturalized to the climate, the food, and other inherent conditions of the central region of Spain. At Huelva there is another flock of Angora goats, composed of 100 head, and from the information I have obtained it prospers very well in the mountainous region of that province."¹ The above extract is instructive, as showing the slowness with which this race is multiplied, the primitive flock having tripled only in 18 years.

In 1854, the Imperial Society of Acclimation of France resolved upon vigorous efforts to appropriate this race. In 1855 it was in possession of a flock of 92 head. This flock was subdivided and placed in different districts in France. But the success was far from encouraging. Many died, and those which survived gave fleeces which were far from satisfactory. In 1858, all the separate flocks were reunited and placed at Souliard in the mountainous and trachytic district of the Cantal. The animals rapidly recovered their health, and were increased without suffering any malady. The fleeces were in an admirable condition, and were fabricated into velvets of such fineness and lustre that it was pronounced that "the wool of the Angora goat has been ameliorated in France." The increase of this flock was disastrously checked by the rigorous winter of 1859, and the rainy and damp summer which succeeded. "The abundant snows of the winter," says M. Richard, "prevented on the one hand the goats from issuing from their stable; the stabulation favored in them a predominance of the lymphatic system. On the other hand the showers and the incessant rains of the spring continued during the whole summer. The goats, always in a damp atmosphere, eating wet grass, contracted as well as the sheep an aqueous cachexy; a third of the animals succumbed from this malady. If energetic means had not been employed upon the first symptom of the invasion of the affection which was decimating the flock, it is very prob-

¹ Rapport de M. Ramen de la Sagra. Bull. supr. cit., t. i, p. 23.

able that few would have survived. The malady was arrested by a tonic and fortifying medication." The flock, reduced from 92 head in 1855 to 70 in 1862, was at the latter period in good health.¹

The experience in France, although by no means encouraging in all respects, is instructive as indicating the principal cause of the destruction of the flocks, exposure to a damp climate. The excessive climate of the middle and northern districts of this country, the cold winters and warm dry summers, would seem to indicate these districts as most favorable to the acclimation of this species. Experience has fully confirmed what might have been assumed *a priori*. The first importation was made in 1849, by Dr. J. B. Davis, of eight Angora goats, two bucks and six females. The facts relative to subsequent importations and their results are given in the elaborate article of Mr. Diehl, which, being readily accessible in the widely circulated Agricultural Report of 1863, I need only briefly refer to. Mr. Diehl gives the results of his observation of most of the flocks, proceeding from some 300 head imported from Angora, numbering, according to him, several thousand, and scattered mainly through the southwestern States, as follows:

"We have either personally visited and examined most of the localities and flocks (mentioned by him,) seen or obtained animals or specimens of the wool, comparing them with what we saw abroad and the best specimens of wool to be obtained from abroad, or the best imported ones, and are well satisfied and thoroughly convinced that we have succeeded, and can continue to succeed, in raising this valuable wool-bearing animal, with its precious fleece, almost anywhere throughout our country where sheep will prosper, especially in the higher and colder localities, producing an animal more hardy, with a heavy and more valuable fleece than the Angora or Cashmere itself in its own country. The specimens of wool in our possession are more silky and fleecy than the imported or original ones." M. Diehl gives extracts from original communications of practical stock raisers confirmatory of his statements. It is to be regretted that the value of these observations is diminished by the want of accurate discrimination between the products of the crosses and animals of pure blood.²

¹ Sur les animaux de la Société d'Acclimation, par M. Richard (du Cantal,) t. ix, p. 5.

² Of the recent importations of Angoras into this country the most considerable have been made by M. Winthrop W. Chenery, of Belmont, Massachusetts, (office 196 State street, Boston,) who has made arrangements for this purpose with a commercial house having a branch in Constantinople and a confidential agent in the district of Angora. Mr. Chenery, who is an experienced stock breeder, has imported about 300 animals of this race, and has at present 80 or 90 imported animals upon his farm at Belmont, which are for sale. The first Angoras sent to California were imported by Mr. Chenery, 26 full-blooded animals having been introduced by him into that State. The experience of Mr. Chenery and the excellent condition of his flock, which I have visited, are conclusive as to the successful acclimation of this race in this country. The first animals under his charge were placed upon his farm by an agent of Dr. Peters, of Georgia, at the breaking out of the rebellion. These animals having been sheared under the direction of the agents of Dr. Peters, were immediately exposed to cold easterly winds, and several became affected by a pulmonary disease and died.

APPLICATION OF PRODUCTS.

It has been already stated that mohair is not a substitute for wool, but that it occupies its own place in the textile fabrics. It has the aspect, feel and lustre of silk without its suppleness. It differs materially from wool in the want of the felting quality, so that the stuffs made of it have the fibres distinctly separated and are always brilliant. They do not retain the dust or spots, and are thus particularly valuable for furniture goods. The fibre is dyed with great facility and is the only textile fibre which takes equally the dyes destined for all tissues. On account of the stiffness of the fibre it is rarely woven alone; that is, when used for the filling, the warp is usually of cotton, silk, or wool, and the reverse. It is not desired for its softness in addition to silkiness, such qualities as are found in Cashmere and Mauchamp wool, but for the elasticity, lustre, and durability of the fibre, with sufficient fineness to enable it to be spun. Those who remember the fashions of 30 or 40 years ago may call to mind the *camlets* so extensively used for cloaks and other outer garments, and will doubtless remember that some were distinguished for their peculiar lustre and durability, which was generally attributed to the presence of silk in the tissue. These camlets were woven from mohair. Its lustre and durability peculiarly fit this material for the manufacture of braids, buttons, and bindings, which greatly outwear those of silk and wool. The qualities of lustre and elasticity particularly fit this material for its chief use, the manufacture of Utrecht velvets, commonly called furniture plush, the finest qualities of which are composed principally of mohair, the pile being formed of mohair warps, which are cut in the same manner as silk warps in velvets. Upon passing the finger lightly over the surface of the best mohair plushes, the rigidity and elasticity of the fibre will be distinctly perceived. The fibre springs back to its original uprightness when any pressure is removed. The best mohair plushes are almost indestructible. They have been in constant use on certain railroad cars

Mr. Chenery by proper precautions has since preserved his flock in perfect health. A warm but ventilated shelter is provided, to which the animals have access summer and winter. In a flock of nearly a hundred, not one has died for a year. Mr. Chenery regards these goats as more hardy than sheep. They are fed in the same manner as sheep, with the exception that white-pine boughs are occasionally given them to browse upon during the winter. They delight in rocky and bushy pastures, feeding eagerly upon barberry and raspberry bushes. They cannot be confined by ordinary stone walls, but are restrained by any fence which they cannot climb, as they do not jump. They are herded and driven more easily than sheep. The doe never produces more than one kid at a birth. The young demand attention when they are first dropped, as they are liable to chill. After they have once suckled there is no further trouble. Although quite small at birth, they grow with great rapidity. The average product of fleece is, for bucks, seven, eight, and sometimes as high as 12 pounds. The does produce from three to five pounds. Mr. Chenery states in illustration of the hardiness of this race, that seven animals sent round Cape Horn were six months upon the voyage, and all arrived at their destination in good health. It is stated that if there should be a sufficient demand for these animals there would be no difficulty in increasing the importations to some thousands per year.

in the country for over 20 years without wearing out. They are now sought by all the best railroads in the country as the most enduring of all coverings, an unconscious tribute to the remarkable qualities of this fibre. The manufacture of Utrecht velvets at Amiens in France consumes 500,000 pounds of mohair, which is spun in England. Ten thousand workmen were employed in weaving these goods at Amiens in 1855, the product being principally sent to the United States. The mohair plushes are made of yarns from No. 26 to No. 70; the tissues made of the former number are worth four francs per metre, and of the latter 10 francs per metre, showing the importance of preserving the fineness of the fleece. A medium article is made extensively in Prussia, of yarns spun from an admixture of mohair with combing-wool, but it is wanting in the evenness of surface and brilliant reflections or bloom of the French goods. Mohair yarn is employed largely in Paris, Nismes, Lyons, and Germany, for the manufacture of laces, which are substituted for the silk lace fabrics of Valenciennes and Chantilly. The shawls frequently spoken of as made of Angora wool are of a lace texture, and do not correspond to the cashmere or Indian shawls. The shawls known as llama shawls are made of mohair. I have seen one at Stewart's wholesale establishment valued at \$80, weighing only $2\frac{1}{8}$ ounces. Mohair is also largely consumed at Bradford, in England, in the fabrication of light summer dress goods. They are woven with warps of silk and cotton, principally the latter, and the development of this manufacture is due principally to the improvements in making fine cotton warps, the combination of wool with mohair not being found advantageous. These goods are distinguished by their lustre and by the rigidity of the fabric. All the mohair yarns used in Europe are spun in England, the English having broken down by temporary reduction of prices all attempts at spinning in France. Successful experiments at spinning and weaving Angora fabrics have been made in this country, as shown by the samples of yarn spun by Mr. Cameron, and the dress goods spun and woven by Mr. Fay of the Lowell Manufacturing Company, from Angora wool grown by Mr. Chenery, of Belmont.

Before the demand of this material for dress goods and plushes, mohair was largely used in Europe and this country for lastings for fine broadcloths, the lustrous surface acting as a frame in a picture to set off the goods. This use is now abandoned. Mohair is now extensively used to form the pile of certain styles of plushes used for ladies' cloakings, also for the pile of the best fabrics styled Astrakhans. Narrow strips of the skin of the Angora with the fleece attached have been recently in fashion for trimmings, and great prices were obtained for a limited number of the pelts for this purpose. The skins with the fleeces attached will always bring high prices for foot rugs, on account of their peculiar lustre and the advantages they possess over those made of wool, in not being liable to felt.

Nearly all the raw mohair of commerce is at present consumed by a very few manufacturers in England, who first commenced spinning in

1835, at the suggestion of Mr. Southey, and soon excluded the Turkish yarns by the superiority and evenness of their yarns. The enormous works of Mr. Salt, in England, were erected in 1853, mainly for the manufacture of mohair and alpaca fabrics.¹ The annual exports of mohair from Turkey as well as other instructive facts are given in the following letter, addressed to Messrs. G. W. Bond & Co., December, 1867, by Bauendahl & Co., a leading wool and commercial firm in New York, obtained at my request :

“Agreeably with the request of your Mr. G. W. Bond, we beg herewith to hand you all the information we have regarding mohair or goats’ wool.

“Good mohair (Angora goat) is not known as an article of commerce anywhere but in Asia Minor. It is received from Asia Minor in bales varying from 150 to 200 pounds in weight, as most convenient, each fleece carefully rolled up and tightly packed. The exports from Turkey are as follows :

Years.	Bales.	Years.	Bales.	Years.	Bales.	Years.	Bales.
1850.....	12, 884	1861.....	16, 592	1863.....	14, 812	1865.....	27, 641
1860.....	11, 902	1862.....	17, 706	1864.....	19, 761	1866.....	22, 068

“We have seen samples of goats’ wool grown in South Africa and this country, but they had degenerated, becoming coarser and losing the lustre and silky appearance which gives the staple most of its value. It is consumed by less than a dozen houses in Europe; in fact, one firm consumes about one-third of the whole supply, and has agents in Turkey choosing the same. It is a very peculiar article; either everybody wants it, or no one will touch it. There seems to be no steadiness in the trade; but the demand is seldom in abeyance for more than four months at a time. Large buyers have avoided it for some time; therefore stocks have accumulated to a considerable but not excessive extent.

“About two years ago the price was up to nearly 96 cents gold, and fell, after long inaction, to about 50 to 54 cents gold per pound for super white Constantinople; but even at this price there is very little demand. The value of second-class locky lots is always very uncertain. It forms, however, only a trifling portion of the exports, and will fetch about 20 to 30 cents gold per pound.

“Fawn, a dark gray mohair with long staple, is usually salable at 24 cents gold to 30 cents currency. There is also a fair kind of brown mohair, but shorter and more cotted, that we think sells best in France at prices between 20 to 30 cents gold. The terms on which this article is sold in the market are cash in one month, less five per centum discount; England, tares actual, and one pound draft, per cwt.”²

¹ Vide Jame’s History of the Worsted Manufactures.

² Since this paper was written Messrs. Bauendahl & Co., have furnished important information in a letter dated September 17, 1868, and published in the *Country Gentleman*.

I have ascertained from other sources that the price of mohair in England of late years has been about double that of the best English combing wools.

RECAPITULATION AND CONCLUSION.

Experience in Europe, confirmed by observations in this country, has demonstrated the practicability of the acclimation of this race under favorable conditions of the climate, without degeneracy of the fleeces. There are districts in this country possessing climate, temperature, and hygrometric conditions corresponding to those observed in Asia Minor and Europe as favorable to the culture of this race. The Angora goat and the domestic goat of Europe and this country, having descended from separate sources, the obtaining of good results from the crosses of these two races is theoretically improbable, and is demonstrated to be so by the best experience in Europe. The normal fibre desired for the textile arts is only to be found in flocks of the perfectly pure race, and perhaps in flocks bred back to the standard of the pure race by crosses of a perfectly pure buck with the black Asiatic goats of the same race.

They say: "The recent remarkable increase in the consumption of goat wool in Europe has induced us to bring the subject under the notice of American wool-growers. Manufacturers here would use mohair largely if they could depend upon a regular supply, and, as we have the fact now established that, with sufficient care, goat's wool can be raised of a superior quality here, we think that the time has arrived when every possible effort should be made by our wool-growers to supply the want. The trade offers a most extensive field and prospects of ample profits.

"Mohair, as an article of commerce, is at present not grown anywhere but in Asia Minor, and the entire exports to England last year amount to 2,200,000 pounds. This is quite inadequate to accommodate the present demand, and the necessity of a larger supply becomes daily more and more manifest. We have seen samples of mohair grown in South Africa, but they had degenerated, becoming coarser and losing the lustre and silky appearance which give the staple most of its value.

"We hear that last month large sales were made in England at about 80 cents, gold, per pound, and at this price consumers continue to buy freely when good staple and condition are assured. The stability of this price, however, is uncertain, and the value is dependent on the demand of the fancy trade, though this article has gained greatly in steadiness by its being employed in many new fabrics for upholstering purposes, laces, dress goods, &c.

"This article we receive for sale on consignment, and our last lots realized from \$1 to \$1 25 (currency) per pound, just according to quality and condition. The latter price has been likewise paid for a small lot forwarded to us by a breeder near Frankfort, Ky., who is also interested in raising *full-blood* goats. We find it exceedingly difficult to place second-class lots; in fact, such are hardly salable, and their value is very uncertain. The great fault of goat's wool is the abundance of scurf and kemps, (dead hairs,) and the greatest attention should be directed towards avoiding these evils.

"In Europe mohair is consumed by less than a dozen houses; in fact, one firm consumes about one-third of the whole supply. It is important to have the mohair well and regularly packed in good sacks, weighing about 250 or 300 pounds, as most convenient for the trade."

It will be observed that the practical observations of these experienced wool buyers confirm the views presented in the above paper as the worthlessness of the fleeces of crossed goats. I have examined several pelts from South Africa, evidently from crosses of the Angora and common goat, in which the fine wool from the Angora was so mixed with coarse hairs of the common stock as to render the fleeces useless for textile purposes.

It is desirable that importations should be made of the black female Kurd goat of Asia Minor, for crossing with the pure white bucks. There is evidence of great weight in favor of good results from such cases.

Systematic measures of acclimation must always be impeded by the eagerness of breeders for sale to obtain merchantable results. The appropriation of this race is of sufficient importance to deserve the earnest attention of the government, as the best races of the merino sheep have been only secured through the persevering and disinterested efforts of governments in Europe. In the absence of any national society for acclimation in this country, a deficiency which ought not long to exist, the Department of Agriculture, under its present vigorous and intelligent head, offers the best means of securing the desired results. The cost of a single Rodman gun would secure a magnificent flock to serve for prolonged experiment and as a model to our agriculturists. Producers cannot expect to obtain remunerating prices for their fleeces until the manufacture of mohair fabrics is established in this country. It must be years before a sufficient supply is grown here to occupy a single mill. The fleeces of over 10,000 sheep are consumed every week in the single establishment of the Pacific Mills. It is probable that there will be a demand for all that can be grown for some time, for yarns for braids, and for Astrakhan cloakings, which are being made in Rhode Island. The demand for animals of the pure race will increase without reference to the value of the fleeces. There are enough agriculturists of taste and wealth in this country who will readily pay large prices for these docile and beautiful animals, simply as ornaments for their farms.

I am convinced that the greatest obstacle to the permanent acquisition of new resources from any department of nature is exaggerated expectations as to their value and facility of acquirement. Our impatient countrymen need to be reminded that real progress is the offspring not only of human effort but of time, and that of acclimation especially it may be said: *Non solum humani ingenii sed temporis quoque filia est.* There is encouragement, however, in the fact that the fruits of decades or centuries in older countries are matured here in years. In how brief a time has this vast country been stocked with all the animal wealth which Europe had to bestow! How rapidly have we appropriated all the best ovine and bovine races of the old world! Within half a century we have spread the merino sheep over all the prairies of the West, and within a less period have acquired and perfected the cattle of the Durham short-horn breed, and even sent them back to ameliorate the parent stock in England. The hope then is not vain that the precious race, whose slow march westward we have traced from the remote East, may at no distant time be fully secured for the western world.

APPENDIX C.

THE WOOL BEST ADAPTED TO VARIOUS MANUFACTURES.

Extract from the proceedings of the convention of delegates from the National Association of Wool Manufacturers, and from the several organizations of the wool-growers of the United States, at Syracuse, New York, December 13, 1865.

The fourth subject for discussion was then taken up, to wit, the wool best adapted to the various manufactures, especially that of worsted.

The PRESIDENT. We should be glad to know what you do with our wools; what kind of wools go into what kind of fabrics. We should be glad of some practical information upon that subject.

Mr. HAZARD. The president of our association (Hon. E. B. Bigelow) has paid more attention to this subject, perhaps, than any other person, and I hope we shall hear from him upon it.

Mr. BLANCHARD. If the inquiry is with reference to worsted wools particularly, I think our secretary has some facts in regard to it that will be of interest to the wool-growers here. But, sir, in connection with that, if I may be indulged with the attention of the assembly for a few moments, I would like to express briefly some views of the different kinds of sheep, which, in the estimation of manufacturers, it would be desirable to raise in this country.

There are diversified interests among the manufacturers. There is a great diversity of talent among them. One man, possessing a taste, a cultivated taste, if you please, for fancy articles, will enter upon the manufacture of those fabrics that are styled fancy goods, and succeed in them admirably, and to the entire satisfaction of himself, as well as benefit to the community. Another man, attempting to produce the same article, would fail in business in less than six months. I know some men who have spent almost a lifetime in making black doeskins, until they have attained a perfection in the article that is almost unsurpassed by the Germans. Let those same men attempt to manufacture a cheap article, and the probability is that they would fail to accomplish their object.

Now, I have thought that perhaps the same principle might apply to wool-growers. In my experience with the wool-growers of the country, I have sometimes found a man who would take a Saxony flock of imported sheep, retain all their excellence, and continue to improve on that flock, until he had secured perhaps one of the best in the United States. I have now in my mind one man in Washington county, of whom you may have heard, I mean Mr. Samuel Patterson, whose flock was, if not superior, at least fully equal, to any other in the State of Pennsylvania. He had a taste for it; and by his knowledge of the habits of Saxony sheep

he was enabled to cultivate them, and to cultivate them with success. Other men prefer to cultivate the merino sheep; and, in the application of their minds to that branch of sheep culture, they have been eminently successful. Another class of men, living near large cities, who may go into Canada, or into some of the sections of the country where a large kind of sheep are grown, purchase their stock, take them to the vicinity of the large cities, put them upon their pastures, feed them until they become fat, and then take them to market and sell them for mutton; such men, though the wool that is upon these sheep is coarse wool, are successful in that branch of sheep husbandry. Hence, it seems that we need this diversified application of the talent of the country in the production of the raw material, as much as we need the diversified talent that exists among manufacturers in producing the various articles we want.

Now, if this is so—I make these remarks to throw the thought before the minds of the wool-growers—is it wise to abandon the growth of Saxony wool? If I mistake not the public sentiment of the wool-growing community at the present time, it is that the grade of wool which is usually denominated merino is fine enough to meet the wants of all the manufacturers of this country. Let me assure you that it is not so. Unless you do produce the Saxony wool, we, as manufacturers, will be forced to resort to foreign markets for a supply. There are certain fabrics manufactured to-day that cannot be made without that grade of wool which is denominated Saxony wool, fine wool, finer than any other that is produced in this country, (I use the words as they are practically used among farmers, without specifying the difference that exists between them.) If you wish to-day to make a very fine broadcloth—and if the object we have in view is carried out, that the manufacturers of this country are to supply the wants of the country—you must have clean, fine wools to do it; such wools as the Australian, Cape of Good Hope, or German wools. If you don't, you cannot make the article.

I will give you an instance, to show the difficulty of getting this fine wool, which illustrates the point I have in view. I am engaged in the manufacture of ladies' shawls. The consumption of our mill, for the year, is about 350,000 pounds. In the last six months, I directed the sorters, if they found what we term a "pick-lock" fleece, to lay it aside. During these six months they have only saved about 400 pounds of that quality. The next grade we use is what is ordinarily denominated the fine wool of this country. From that we have made an article, which, when taken to New York, was sold to a prominent importer at an advance of $33\frac{1}{3}$ per cent. over any article of the kind ever made in this country, I believe, except, it may be, something that was made for exhibition at a fair.

I only allude to this to show that that kind of wool must be produced in this country if we intend to supply the demand of this country for fine fabrics. If that be so, is it wise on the part of the wool-growers of this country to abandon the raising of fine wools? I know you may turn on

me, and say, "You won't pay us for it;" but I say we will pay you for it, if you will sell it as cheap as we can get it from the foreign grower, and not without. That is plain common sense: I say we can pay you for it; and I say that, if properly classified and properly presented to the manufacturer, you can get your price for it. But you can't take your Saxony wool to the manufacturer of fancy cassimeres, who wants a medium grade of merino wool, and expect that he will pay you as much for it as the manufacturer of fine broadcloths, fine doeskins, and fine shawls. Unless you can present that wool to the manufacturer who wants to use it, you can never get its value. If it is sold to the passing buyer, who is travelling round the country, he will give perhaps a cent and a half a pound more for it than for ordinary wools.

I simply call your attention to this matter that you may think upon it and act upon it as your judgment may dictate. I now renew my call upon our secretary for facts in his possession in relation to worsted wool.

Mr. JOHN L. HAYES, of Massachusetts. I will respond with pleasure to the request of the gentleman from Connecticut, and submit to the convention some considerations bearing upon the importance of increasing the production of combing or worsted wools in this country; but, before addressing myself to that special subject of inquiry, I desire to call attention to some facts which will throw light upon the extent to which wool in general is used in the textile arts, and which will illustrate the demand in the markets of the world for this material, and the tendency of the age towards its increased consumption. There is no more interesting or practical question, to the producer of wool especially, than the inquiry whether there is a demand for his product, and whether there will be such an increased demand as will continue prices, and justify him in expending capital for increased production.

In pursuing this inquiry, we are struck with the observation that nature is economical in the supply of the raw material, or rather in the varieties of raw material, which are to be worked up by man. How few are the great natural staples which make up the bulk of commercial commodities. But the uses of any raw material, which is found applicable in the arts, are infinite. We utterly fail to imagine the new applications to which such raw material may be made. Every improvement in the arts, in chemistry or machinery, each new step in the progress of civilization or luxury, increases the modes of application and consequently the demand. The demand for a particular fabric or manufacture may cease through change of fashion, but the demand for the raw material never.

The demand for wool received its most important impulse in modern times at about the commencement of the present century, or perhaps the latter part of the last century, from the great improvements which were made in cotton machinery, which were applied also to wool. The improvements in the spinning jenny, the introduction of the power-loom, and the establishment of the factory system, multiplied the power of the

manufacturer to such an extent, that an unprecedented demand for wool began to arise. Then the increased use of other kindred fibres added also to the consumption of wool. It is a curious fact, that cotton, although it has always been regarded as the rival of wool, has added largely to its consumption. It is stated by English observers, that the use of cotton warps has added vastly to the extent to which wool is used in England. Entire factories are now engaged in the manufacture of cotton warp; and it is found that, by the use of this warp with woollen filling, cotton, instead of being a competitor, is the most important auxiliary of wool.

I will now refer to the statistics which illustrate the progress of the demand for this material. The increase in the consumption of wool is strikingly shown by a comparison of two periods in England, no further apart than 30 years. The importations of wool into England 30 years ago were—from Germany, in round numbers, 74,000 bales; from Spain and Portugal, 10,000 bales; the British colonies, 8,000 bales; sundry other places, 5,000 bales. Total in 1830, 98,000.

Now compare these imports with those of 1862 and 1864. In 1862, the imports from Australia were 226,000 bales; from the Cape of Good Hope, 66,000 bales; from Germany, 29,000 bales; from Spain, 1,000 bales; from Portugal, 11,000 bales; from Russia, 40,000 bales; from the East Indies, 52,000 bales; from South America, 80,000 bales; sundry other places, 96,000 bales. Total, 585,000 bales. Then we come to 1864, and we find from Australia, as against 226,000 in 1862, 302,000 bales; as against 66,000 from the Cape of Good Hope in 1862, 68,000; as against 80,000 from South America in 1862, 99,000. In all, in 1864, 688,336 bales.

Comparing that with the importation only 30 years before, we have 688,000 bales as against 98,000. Australia now supplies more than three times the whole amount of foreign wool consumed in England a third of a century ago. The production of South America exceeds the whole consumption then. In this short period, the consumption has actually increased seven-fold. The production of wool in England is 250,000,000 pounds; the imports, 184,000,000; the exports, 54,000,000; so that the total amount consumed in England is 380,000,000 pounds. Add to that the shoddy, of which 65,000,000 pounds are consumed, and we have the enormous total of 445,000,000 pounds of wool consumed in England alone.

Now this increase of production and consumption is not confined to England alone; it goes on in the same ratio in other countries. In 1861, France exported woollen goods of the value of 188,000,000 francs; in 1863, 283,000,000 francs. The production of Germany, Russia, and Austria is increasing in the same ratio; so that we have now, it is estimated, a consumption in all the world of 1,600,000,000 pounds of wool, and yet hundreds of millions of people, as in China, are just beginning to appreciate the value of woollen fabrics. Even France has but just commenced to supply herself with carpets.

The testimony taken before the House of Lords in 1828 shows that, although less than 98,000 bales of wool were brought into England at that time, every warehouse was filled with wool, and stocks were lying on hand sometimes for five or six years; whereas, at the present time, as I am informed by an English gentleman of great intelligence, and a very large dealer in wool, Mr. Bowes, the warehouses are exhausted, and there are no stocks on hand. The demand is fully up to the supply.

The facts in relation to prices are not less interesting. In 1855, the price of English combing-fleeces was 1s. 1½*d.* In 1864, the price of the same wools was 2s. 4*d.* Australian fleeces averaged in 1855 1s. 8*d.*, in 1864, 1s. 10*d.* Cape fleeces in 1855, 1s. 5*d.*; in 1864, 1s. 4*d.* Buenos Ayres, fair mestizo, in 1855, 7*d.*; in 1864, 8*d.* Cordova, in 1855, 8¾*d.*; in 1864, 11½*d.*

Thus we see that the fine wools have not declined; they have kept about the same ratio.

But the question still remains, Will the demand for the fine wools, relatively to other kinds, continue? In considering that question, it is worth while to look at the production of Australia particularly, and the facts which show the extraordinary increase in the ratio of production in the Australian colonies. In 1797 three merino rams and five ewes were carried there; but so slow was the introduction of the production of wool into those colonies, that it was not till 1807, 10 years later, that the first bale of wool was carried from Australia to England. But the flocks of Australia did not originate from that source. The development of fine wool husbandry in these colonies was the result of an accident. Some English whalers captured in the South Seas, about the beginning of the present century, a vessel proceeding to Peru from Spain, in which there were 300 merino rams and ewes. These sheep were carried to Australia, and originated the fine merino wool, whose production is now estimated at 100,000,000 pounds; and are sold in special market at London, to which all the manufacturers of the world resort. The production of fine wool of La Plata is estimated at 100,000,000 pounds; and that of the Cape at 50,000,000 pounds. And when you remember that only a portion of Australia has been developed, and that the vast and fertile interior still remains to be opened up, who can tell what shall be the production in the future? The pampas of the Argentine Republic offer even a more unbounded field for production. They present a vast uplifted alluvial plain, 800,000 square miles in extent, presenting an ocean of verdure, where wool-growing in the production of fine wool called *mestiza*, or improved wool, is pursued with more vigor and profit than in any other part of the world, with the single drawback that the value of the wool is greatly impaired by burrs derived from a species of clover peculiar to the vegetation of the pampas. In view of the fields for the production of fine wool, thus rapidly expanding, which are opened abroad, it is well to inquire whether it may not be desirable to turn our attention to some other of the various kinds of wool in which the competition of foreign countries is not likely to be so formidable.

In considering this matter, the producer of wool should not overlook the competition with clothing or merino wool of a material which was not known in manufactures until the present century. I refer to shoddy, or rather that variety of shoddy known in England by the name of mungo. The term "shoddy," strictly speaking, is the name applied to fibre made from soft rags, from flannels and blankets which were first used in manufacture of cloth. The use of this material originated at Batley, in England, in 1813. Mungo is the fibre obtained from hard rags of fine broadcloth, such as clippings from the tailors' shops. This was not introduced until later, and the manufacturers of Batley were quite incredulous of its being utilized. The Yorkshire man, who first conceived the idea of using the fibre of hard rags, obstinately replied to the objection that the material could not be introduced, "It mun go," (it must go.) It did go, and a new substance was introduced into the arts, and a new word into the English language. Of shoddy and mungo 65,000,000 pounds are consumed in England, more than our whole clip of wool in 1860. It is estimated that 25,000 persons are employed in converting shoddy into cloth, and that the value of the product is five or six million pounds sterling. The fact, however, to which I wish to call attention is, that shoddy comes in competition with fine or cloth wool only. It is not used in the manufacture of worsted, and does not take the place of combing-wools.

When we look at the facts as to prices before given, we find that the English combing-fleeces were worth in 1855 only 1s. 1½d.; in 1864 they were worth 2s. 4d.; that is, they had more than doubled in 10 years, while cloth-wools had just about held their own in respect to price. England is the only country which has devoted itself exclusively to the production of the long combing-wools required for the manufacture of worsted. She cannot, or does not, produce any fine wool. There are, in fact, no merino sheep in England. It is believed, however, that England has attained to the utmost production of this wool of which her limited territory is capable. The manufacturers of Bradford are already alarmed, and have issued circulars to induce a greater supply of lustre wools. England is the only country which now produces, to any extent, the long combing-wools. It is found that in Australia the combing-wools cannot be grown; and they cannot be grown at the Cape. I have the authority of Mr. Bowes for saying that the experiment has been fully tried, and has signally failed; that Leicester, Cotswold, and Lincolnshire sheep have been repeatedly carried to Australia and the Cape, and every effort made to introduce the culture of long-woolled sheep; but it has been found that after a little while the wool is converted into hair, and it is now admitted that the long combing-wools cannot be grown in Australia or at the Cape. But the combing-wools *can* be grown in the United States. The fact of the fitness of this country for the growth of combing-wools is completely established by the success which has attained the production of that kind of wool in Canada. The amount of comb-

ing-wools now produced in Canada is between five and six million pounds. The quality, in the English market, is not regarded as by any means equal to their own combing-wools, because the same care is not taken in its production, and the English complain that the wool is full of burrs. In England the most extraordinary care is taken. The fields are actually swept, that the fleeces may receive no injury from dirt. But our worsted manufacturers have found the Canada wools perfectly good substitutes for the English wools, and have paid as high as \$1 40 currency for wool worth five years ago only 28 cents. The attempt has been made in this country to manufacture alpaca goods from this long combing-wool, for which, by reason of its lustre, it is peculiarly fitted. There was some failure in the first experiment, and the manufacturers supposed that the wool was not suitable. They then sent to England, and imported 1,000 pounds of the best combing-wool; and, upon a comparison of that with the combing-wool of Canada, it was found that the Canadian wool was equal to the English in every respect. I have here some specimens of this fabric, which is called "alpaca" because it is an imitation of the fabrics made from alpaca wool. (The speaker held up the specimens to the view of the convention.) This stuff is made of a filling of the long combing-wool of Canada with a warp of cotton. The fabric is equal in finish and lustre to any imported from England.

The question is eminently worthy of the consideration of our farmers, whether the long-wool husbandry may not be profitably introduced into this country. This is a question upon which we, as manufacturers, pretend to give no opinion. We can only assure the farmers of the United States, that there is a growing demand for this material, that there will be less competition in the growth of this wool than in any other, and that the prices are certain to be higher than for any wool which can be grown in this country. To determine the question of profit, it will be necessary that experiments upon an extensive scale be tried, and will be doubtless necessary that a system of husbandry should be developed in this country analogous to the four-field system in England, but fitted for the peculiar necessities of our soil and climate. I can conceive of no subject more worthy of the attention of the National Association of Wool-Growers, formed here to-day, or of the boards of agricultural colleges in the several States.

It may be said that the introduction of long-wool husbandry will interfere with that already established in this country. I see no force in this objection. It is probable that this kind of sheep husbandry can be profitably carried on only in those districts where there is a demand for mutton, and where the mutton will be as much an object as the wool. It seems to me, Mr. President and gentlemen, that the development of this species of sheep will not interfere with the branches of sheep husbandry which are now pursued, but will give an increased demand for the peculiar kind of merino wool now being produced by the intelligent skill of the Vermont breeders. Dr. Loring this morning quoted some remarks

of mine in reference to the peculiar value of the American merino fleece. I am convinced that the fabrics to which the coarse merino wool that seems to be in favor here is best adapted, have not yet been manufactured in this country to any extent. The class of goods to which that wool is peculiarly fitted are the fabrics somewhat analogous to the goods called "coburges" and the goods called "merinoes" and "thibets," the soft stuff goods for women's wear. Now, in that branch of manufacture, or that of stuff goods as distinguished from cloth goods, France employs 300,000 persons. In this country, there were not 5,000 employed in 1860. The remarkable development of that branch of industry in France is attributed to the peculiar qualities of the merino wool which the French possess. This wool is long in staple, the sheep are of unusual size, and the fleeces heavy, having, in fact, the very characteristics of the American merino. M. Benoville, a very eminent manufacturer and a practical man, who has written a work on the combing-wool industry of that country—one of the most learned works that has ever been written upon any branch of the practical arts—describes these fabrics in detail, and gives the reasons why France has obtained such eminence in their production. The most important reason which he gives is in these words:

"The first fact that we ought to proclaim abroad is, that without the introduction of the Spanish race into our flocks, and without all the skill of our agriculturists, we should still vegetate in dependence upon neighboring nations, and should be reduced to clothe ourselves with their stuffs. It is to the admirable revolution in the raising of ovine animals that we owe the beautiful industry of spinning the merino combing-wools. It is to this that we owe the splendor of the industries of weaving combing-wool at Paris, at Rheims, at Roubaix, at Amiens, and St. Quentin."

Now, I wish to enforce this position. In order that the worsted manufacture should be developed in this country—and by the worsted manufacture I mean the manufacture of stuff goods in their infinite variety for female apparel and furniture trimmings, &c., as distinguished from cloth goods—there must first be a supply of long combing-wool from sheep of the English breed. The development of the manufacture created by the supply of these wools will be the most certain means of creating the demand for the long merino wools for soft stuff goods, for which I have shown they are peculiarly fitted. We are as yet but in our infancy in our manufactures. The work before us, as wool-growers and manufacturers, is to clothe all the people of the United States with our wool and our fabrics. We have but just commenced the work; and when a full supply of raw material is furnished, and grower and manufacturer are encouraged by a stable system of protection, the imagination can hardly conceive the grand field which will be opened in this country in the industry of wool and woollens.

* * * * *

Mr. GEORGE W. BOND, of Massachusetts. In my position as chairman of the committee on raw materials, I have given some attention to

this subject. Our annual import of worsted goods from Great Britain is about fifty million yards, besides a very large amount, of which we have no accurate record, from France. Those from France are principally of a character for which our long merino wools are admirably well adapted. We need to make all the varieties of goods that we consume in this country, of all the varieties of wool that we produce. Had I known, before I left home, that this question was to come up in this form, I could have prepared myself with an approximate statement of the quantity required of the different kinds of wool. In round numbers, we require some fifteen million pounds of wool, in the state in which it generally comes to market. A little of the grade of wool such as it is unprofitable to grow here is grown on the plains west of the Mississippi; but the amount is trifling. The great bulk of the wool which we require is of the merino grade, which we use for our cassimeres, flannels, and delaines; and I trust that as we increase in the development of the length of the staple of the merino, the fabrics which the secretary has referred to will soon be added. Experiments are being made now which I think will lead soon to their extensive manufacture. The other great branch of manufacture is that of worsted goods, of which there is a great and immensely increasing consumption, requiring a class of wool, the value of which alone seems to have been increased by the advance in cotton. We have now no hindrance to that manufacture in this country, save a supply of the raw material. As has been stated, we have hitherto imported from three to five million pounds from Canada; and from that supply we shall be cut off, if the reciprocity treaty is closed the coming spring. What those concerns will then do who have embarked in the manufacture I cannot foresee. We should readily and promptly consume in this country, I think, not less than twenty million pounds of such wools, if we had the supply.

Another class of wools for which we require, for our present consumption, the equivalent of ten or fifteen million pounds, at least, of washed wool—say twenty to thirty million pounds in the condition in which we receive it—are the finer wools, grown in South America, Australia, and the Cape, for the manufacture of goods requiring a close filling and superior finish, which we have been unable to obtain hitherto from any considerable amount of wool grown in this country. Some of the wools grown in Virginia have had these qualities; and when Virginia and East Tennessee come to be settled by Northern men, I hope we shall, from that source, and possibly from some parts of Texas, be able to obtain wools which are adapted to these uses. Until then, we must depend upon foreign markets for our supply. But it is the earnest wish of all connected with the woollen and worsted manufacture, so far as I know, that the growth of these wools should be undertaken; that experiments should be made to ascertain what part of the country is best adapted to them; and that we should have a supply of our own growth.

While I am up, I would allude to a question, the importance of which

I have felt for a great many years; that is, the necessity for a careful study, scientific and practical, of the influence of climate and soil upon wool. All of us here present know that they have an immense influence. What that influence is, has never been settled, I believe, nicely, thoroughly, in this country or any other. In a country so extended as ours, with every variety of climate and soil, it is of more importance than it can be to any other nation in the world. When Professor Agassiz first established his museum of comparative zoölogy, it was a part of his plan to connect with that institution the study of this important subject. The plan he laid out was so vast, that, in bringing it into practical order, he had not reached that when the war began. The war took off a number of young men upon whom he depended to enter with him upon this department of science, and it has thus been delayed. But I hope, when he returns, he will soon be able to take it up there; and the Institute of Technology, also, hopes to devote a part of its attention to the study of that and other matters connected with the practical arts.

Mr. R. G. HAZARD, of Rhode Island. When I was up on a former occasion, I referred to the direct interest the wool manufacturer had in the ability of the wool-grower to produce his wool in the cheapest and most economical manner. Perhaps the wool-grower has an equal interest in the ability and skill of the manufacturer to work up the raw material into goods of the greatest possible value. And upon this subject of worsted wools, I think the producer may find encouragement in the fact that the manufacturers are acquiring skill in that direction perhaps more rapidly than in any other. Some of them have alluded to that subject, and seem discouraged in regard to their ability to produce that kind of wool. But the experiments on which this opinion is founded were probably tried when such wools were very much lower in proportion than they are now. There is, however, an important consideration connected with that; and I think it very desirable that this subject should be seen in all its bearings. That consideration is, that those kinds of wools are grown upon large sheep. Now, in this country, the mutton seems to be comparatively a small object. In Great Britain the mutton is the main object, and the wool merely an incidental production. I have no doubt that many of their farmers, if they should hear of our keeping sheep merely for their wool, would appear as much astonished as some of ours are when they hear of Russian farmers keeping pigs for their bristles. That may affect the production of this kind of wool; but, when we become more a mutton-eating people, it may be more judicious for us to raise these large sheep.

Connected with that subject there is a merely theoretical view, which I should like to state, and learn from practical men how far their experience bears out the theory, in regard to the size of sheep, or any other animal. We are all aware that the surface upon which the wool grows increases as the square of the linear dimensions; while the carcass, which has to be sustained to produce that wool, increases as the cube. For

instance, if you begin with the linear dimension two, the square, being four, will represent the surface upon which the wool grows; the cube, which is eight, representing the carcass of the sheep, which has to be sustained. Now, if you double the linear dimensions—instead of making them two, make them four—you have a surface upon which the wool grows of sixteen; and the cube will be sixty-four. In the one case it is as one to two; in the other, as one to four. According to that calculation it would seem that we ought to raise the greatest quantity of wool per acre upon small sheep.

APPENDIX D.

THE CULTURE OF LONG-WOOLLED SHEEP IN THE UNITED STATES.

BY JOSEPH WALWORTH.¹

Read before the Wool-Buyer's Association of Michigan, June 2, 1868.

PACIFIC MILLS, LAWRENCE, MASS., May 27, 1868.

GENTLEMEN: Your favor of the 25th came duly to hand, and in reply would say that if I could I should have been glad to have been at your wool-buyers' convention.

In reply to your questions on combing and delaine wools, I would say that the wool-growers of the country have run too much into the same quality of wool, viz: about three-fourths blood. Now there is a certain amount of this quality of wool needed; but the markets have been flooded with this one kind, while medium or one-half blood and one-fourth blood wools are absolutely scarce. This was largely brought about by the introduction of the black Spanish bucks from Vermont, and the result has been a deal more soggy and inferior-stapled wool for delaine; so that to-day both in Michigan and Ohio many sections that used to yield largely of delaine yield but very little, and the wool is not so desirable nor salable. Let the farmers learn that it is not profitable, neither for them nor the manufacturers, for them to grow black-topped, heavy, soggy Spanish wool; but rather let them grow good stapled bulky fleeces, that are wool, and not 50 per cent. of worthless grease, and let them grow more variety of wools, and not all just about the same quality. There is a great demand for medium or one-half blood wools, and I think it will be a permanent demand.

But as a buyer of combing and delaine wools, I wish to say a few words on that subject. It is a fact there are not near enough combing nor delaine wools grown, and I am satisfied that if we had more of such wools, especially of the well-bred combing wools, the business that now calls for them would increase very rapidly. For if we had more variety of wools, many kinds of goods which are not made in this country at present (owing to the impossibility of getting the right kind of wool) would be manufactured here. Many persons, and especially wool-growers, are not aware of the importance of the worsted business that call for these wools.

In England the worsted business has grown wonderfully during the last 30 years, so that they need more of the worsted wools than they can grow, and they have encouraged the growth of these wools in Holland and some other countries. This business has also increased very rapidly during the last few years both in Belgium and France. Two years since I was in one firm in the north of France where they combed 3,000,000 pounds of worsted wools a year. They combed on commission for the spinners of the surrounding country.

¹ Mr. Walworth is exclusively employed in selecting and purchasing combing wools for the Pacific mills, and his suggestions are of great practical value.

The worsted business is comparatively a new business in the United States. In 1861 there were only three principal firms that used combing and delaine wools, and altogether they did not use over 3,000,000 pounds per year, while now there are 25 firms in the States, and altogether they use 12,000,000 pounds per year. Besides this large increase in the business in this country, we import very heavily every year of worsted goods. Many ask me if the demand for these wools will be permanent, or only transient. I unhesitatingly reply that the demand will not only be permanent, but must continue to increase; and any one will see that it must be so, when I name a few of the classes of goods made from combing and delaine wools, viz: Delaines, bareges, stuff dress goods of all kinds, serge and moreens for skirts and coverings, braid, Italian cloth for gentlemen's coat linings and for uppers for ladies' and children's boots; damask, for furniture coverings, pew coverings, and table-cloths; bunting, for banners and flags; (all the star-spangled banners in America and all other flags, except silk flags, are made from wool;) reins and girths for horses, many sashes for military men, picture cord and tassels, warps for carpets, clouds, Ristori shawls, &c., &c.

Where is the wool grown for these goods? England and Ireland grow the most and best worsted wools. In some parts of France, in Transylvania, Hungary, and Holland—all these places grow a little combing wool, but they are all second-rate wools as compared with the English. In this country, Upper Canada is the principal place. We now begin to get some good wools from Kentucky, Pennsylvania, Maine, New York, and some other scattered points.

The man who grows combing wool has less competition than the man who grows the common merino wool, for England and France need all the combing wool grown in Europe, and they are already competing with us for the Canada wools; so the man who grows these wools has no competition, and he has a permanent and growing demand for his wool, while the man who grows the merino three-quarter blood has to compete with Australia, where it pays to grow these wools at eight cents per pound, and where but a very few years ago they only raised a few thousand pounds of wool. But now they export to England 100,000,000 pounds per year, and are rapidly increasing; they have to compete with New Zealand, where they grow splendid delaines wool; they have to compete with the Cape of Good Hope, where they now export 50,000,000 pounds per year. They have to compete with Buenos Ayres and the rest of South America. They have also to compete with California, Texas, and the cheap lands and prairies of the west. The merino sheep is adapted to run in large flocks, and pays best where land is cheap, and where they keep sheep only for the wool, for they are not a good mutton sheep, and in all the places I have mentioned mutton is almost valueless, while in England and Canada they keep these sheep as much for the value and profit of the mutton as the wool. And owing to the great improvement in the breeding of sheep and cattle, they can now bring sheep to maturity in England much earlier than formerly, and by this means get good young

mutton for the market. Their wool, as a consequence, has improved very much for worsted purposes. It is grown on younger, better bred, better cared-for sheep than formerly, consequently the wool of the same fineness will spin further and better. Wool from old sheep, or sheep that are running out in breed, is brashy, and will work hairy and rough, and make poor goods.

Canada wool has improved fully 10 per cent. during the last five years. Kentucky has taken hold of this business in good earnest, and they are getting good prices and a quick market for both their wool and mutton; and wherever these wools are grown in the States, they are readily sold at good prices. And they are the most profitable wools to grow for those who are adapted to keep such sheep, for the fleece will weigh from four to six pounds of well-washed wool, and the carcass is large, weighing from 150 to 250 pounds each.

These sheep are more profitable to keep than the merino. I extract from the New England Farmer the following: Mr. Winnie, of New York State, fed the last season 901 head of sheep, 180 of which were merinos, the balance Canada Leicesters, and they were sold for \$12,049.

To test the comparative profit of feeding the two kinds of sheep, Mr. Winnie set apart 60 Leicesters and 61 merinos, which were weighed February 10. The merinos were chosen from 600, and they were the best of their kind. They were kept till March 28, or 46 days. The following is the result:

	Pounds.
February 10, 60 coarse wools weighed.....	8,870
March 28, 60 coarse wools weighed.....	9,878
Gain in 46 days.....	1,008
Total cost of feed, (hay, grain, oatmeal, roots, &c.,) for 46 days	\$174 43
	Pounds.
February 10, 61 sheep fine wools weighed.....	6,909
March 28, 61 sheep fine wools weighed.....	7,389
Gain in 46 days.....	480
Total cost of feed as above.....	\$144 78

If the coarse woolled sheep gained 1,008 pounds at a cost of \$174 43, the merinos ought to have gained 836 pounds at a cost of \$144 78 for feed—whereas they gained only 480 pounds, or little more than half in proportion to cost.

As compared with live weight, the coarse wools gained $11\frac{1}{2}$ per cent. in the 46 days, and the merinos not quite 7 per cent.

In Brighton market, the day before Christmas in 1839, there were only 400 sheep offered for sale, while the same day, in 1859, 5,400 sheep were sold in the same market. Fine woolled sheep sold from \$1 50 to \$4 50, while Leicesters sold from \$11 upwards, and in 1866, in the same market,

Leicesters sold from \$10 to \$16 per head. In Cleveland, this spring, I know one farmer who sold 24 Leicester sheep to the butcher for \$12 50 a head.

In one market in England, in Norwich, there are sold every Saturday from 6,000 to 8,000 hoggets or yearling sheep, and they sell from \$12 50 to \$14 50 a head. These are mostly what we call half-bred—that is, some dark faced Down ewe, crossed by a Leicester or Cotswold ram. This makes better mutton than pure Leicester or Cotswold, the meat is not so fat, and the grain is finer, and the half-bred wool is valued in England as highly as any kind.

Now, although it may be most profitable to keep combing woolled sheep, yet it won't do for every one to go into it indiscriminately. Men who wish to have large flocks of sheep—say several thousand—or even a thousand in a flock, ought not to keep these sheep, but will do better with the merino. Men living on the prairies ought not to keep them, for the prairies will not grow combing wool. But I think they should in many parts of Kentucky, Ohio, the hills of Pennsylvania and New York, and in Maine, and in many parts of New England, and in best parts of Michigan. And in particular I would suggest to those farmers who have now in many of the States coarse native sheep, whose wool is common, and does not yield much combing or delaine, that if they would cross these sheep with a Leicester or Cotswold ram—I like the Leicester best—in one year they would receive more than 50 per cent. for their outlay, for their sheep would be larger, and their wool would yield probably 20 per cent. more delaine, or combing, which sells for more and sells quicker, and follow this cross up for a few years, and they might, with very little expense, improve the breed of all such sheep. I do not recommend them to buy very costly rams for common purposes. Let men who make breeding a business buy the fancy bucks.

I would not recommend the farmers in the far west, or in very new countries, to keep these sheep, for in such places the breed is apt to run out, and the wool becomes brashy and hairy, and of very little value. I think Michigan well-adapted for delaine wools of the medium grades. In that branch I have always classed her next to Ohio. Any farmers wanting combing woolled sheep can now find them in many parts of the States as well as Canada. I think Burdett Loomis, esq., of Windsor Locks, Connecticut, has some of the best sheep in the country, and F. W. Stone, esq., of Guelph, Ontario, has a great variety of sheep, and is a large dealer in long-woolled sheep.

Mr. Shields, of Newark, Licking county, Ohio, has tried the experiment on a small scale of keeping these sheep, and has proved it a great success. I saw his wool, and it was equal to any wool I ever saw anywhere. He says it is far more profitable to raise these sheep than the merinos, independent of the great advantage of having so much quicker and surer a market for both wool and mutton.

Yours, truly,

JOSEPH WALWORTH.

Messrs. THOMAS MCGRAW & Co., *Detroit.*

APPENDIX E.

WOOLLEN MANUFACTURES IN THE UNITED STATES.

The number of sets of machinery or series of cards—a set forming the unit for calculation in woollen machinery—employed in the United States, reported to the National Association of Wool Manufacturers, on the 25th of October, 1865, was 4,100. The estimated number in the United States, as all were not reported at that time, was 5,000. The distribution and weekly consumption of foreign and domestic wool appear in the following table:

Statement of aggregate results, obtained up to October 25, 1865, in reply to circulars of February 24 and May 30, 1865, addressed to wool manufacturers.

States.	Returns received.	Sets reported.	Weekly consumption of scoured wool, in pounds.	Weekly consumption of domestic wool, in pounds.	Weekly consumption of foreign wool, in pounds.	Percentage of foreign wool.	Average weekly per set.	Mills to be heard from.
Maine	40	177	93,835	74,120	19,715	19 $\frac{1}{2}$	530	11
New Hampshire	69	361	217,110	174,841	42,299	19 $\frac{1}{4}$	601	28
Vermont	39	112	50,217	32,652	17,565	35	448	19
Massachusetts	186	1,467	857,496	560,396	297,100	34 $\frac{1}{2}$	585	74
Rhode Island	61	340	188,775	152,967	35,808	19	555	15
Connecticut	88	452	252,880	125,486	127,394	50 $\frac{1}{4}$	559	43
New York	154	576	236,510	174,536	61,974	26 $\frac{1}{4}$	411	124
New Jersey	11	64	33,660	25,238	8,422	25	526	7
Pennsylvania :								
Philadelphia	24	68	88,200	68,650	19,550	22 $\frac{1}{4}$	1,297	98
Remainder of the State	57	90	39,054	39,054			434	69
Delaware	6	15	14,050	13,050	1,000	7 $\frac{1}{2}$	937	4
Maryland	1	8	5,400	2,700	2,700	50	675	2
West Virginia								1
Ohio	44	83	32,615	32,615			392	34
Indiana	47	103	51,200	51,200			497	41
Illinois	22	47	23,355	23,355			497	13
Michigan	20	26	9,660	9,660			372	12
Wisconsin	13	25	10,800	10,800			432	6
Minnesota	1	2	1,200	1,200			600	2
Iowa	15	43	17,658	17,658			411	6
Missouri	10	21	16,650	16,650			793	4
Kentucky	7	14	6,600	6,600			400	7
Kansas	1	3	1,620	1,620			540	2
California								1
Oregon	1	4	4,000	4,000			1,000	1
Nebraska Territory								
Total, October 25, 1865.....	917	4,100	2,252,545	1,619,038	633,497	28 $\frac{1}{8}$	550	624

The value of the woollen manufacture is shown in the following:

Table showing the value of woollen goods manufactured in the United States for the year ending June 30, 1864.

[Calculated from official report of United States Commissioner of Internal Revenue.]

States.	Manufactures of wool not otherwise provided for.	Cloths, and all textile, knitted or felted fabrics of wool, before dyed, printed, or prepared in any other manner.	Manufactures of worsted not otherwise provided for.	Total.
Maine	\$3,238,098 67	\$238,385 00		\$3,476,483 67
New Hampshire	9,044,762 00	34,915 00		9,079,677 00
Vermont	3,145,933 67	562,788 00		3,708,721 67
Massachusetts	38,905,399 00	800,531 33	\$897,720 67	40,603,651 00
Rhode Island	2,963,154 33	7,668,531 67	261,014 33	10,892,700 33
Connecticut	11,873,763 67	3,913,965 00	78,912 33	15,866,641 00
New York	10,850,180 00	2,214,802 67	912,792 33	13,977,775 00
New Jersey	2,752,652 00	25,361 67	70 33	2,778,084 00
Pennsylvania	13,022,447 33	3,502,190 00	75,076 00	16,599,713 33
Delaware	548,134 67			548,134 67
Maryland	450,385 33	1,526 67		451,912 00
West Virginia	58,486 00	5,267 00		63,753 00
Kentucky	117,534 33	242,370 67		359,905 00
Missouri	72,980 00	2,364 00		75,344 00
Ohio	1,315,243 00	85,634 67		1,400,877 67
Indiana	545,128 33	11,794 33	1,692 67	558,615 33
Illinois	341,907 00	11,384 00	5,793 33	359,084 33
Michigan	118,094 00	33,754 33		151,848 33
Wisconsin	104,457 67	860 00		105,317 67
Iowa	102,815 67	15,489 67		118,305 33
Minnesota	8,696 00	450 00		9,146 00
Kansas	14,947 67			14,947 67
California	538,956 00			538,956 00
Oregon	128,620 67			128,620 67
Nebraska Territory	45 67			45 67
Total				121,868,250 33

THE PACIFIC MILLS, LAWRENCE, MASSACHUSETTS.

Paper presented at the Paris Exposition.

This paper is a statement written in response to a call from a jury of the Paris Exposition for distinct illustrations concerning “persons, establishments, and localities, which, by a special organization or special institutions, have developed a spirit of harmony among all those co-operating in the same work, and have provided for the material, moral, and intellectual well-being of the workmen.”

“Pacific mills” is the corporate name of a joint-stock company devoted to the manufacture, from the raw staples, of ladies’ dress goods of cot-

ton wholly, of worsted wholly, and of cotton and wool combined, and the printing and dyeing of the same. It is located in Lawrence, State of Massachusetts, United States of America, 26 miles from Boston. Its post office address is, "Pacific Mills, Lawrence, Massachusetts, United States of America."

J. Wiley Edmands, Boston, is the treasurer of the company, and Wm. C. Chapin, of Lawrence, the local agent or manager. The management is confided by about 150 stockholders to nine directors, chosen annually.

The original number of shares of the company was 1,000, costing \$1,000, or 5,000 francs, each, making a total capital of \$1,000,000, or 5,000,000 francs. The cost of the buildings and machinery having exceeded this sum, 1,500 shares more, at same cost, were issued, making the total number of shares to be 2,500, and the cost of the capital \$2,500,000, or 12,500,000 francs.

They commenced operations near the close of the year 1853, but no goods were ready for market until the spring of 1854. The amount of machinery then consisted of 1,000 looms, with carding, spinning, and dressing machinery sufficient to supply them, together with combing machines and spinning for worsted yarn, used in the manufacture of mixed fabrics, and was equal to the production of about 200,000 yards weekly of calicoes and mousseline de laines, with 10 printing machines for preparing these goods for market.

The buildings and machinery have been since increased, so that there are now in operation about 100,000 spindles for spinning cotton, with cleaning, picking, and carding machines to supply them, and about 16,000 spindles for worsted, with all the necessary preparing machines to occupy 3,500 looms for weaving the two classes of goods above named and others, together with 18 printing machines, producing a weekly average of about 700,000 yards. The machinery is propelled by eight turbine wheels, six of them being 72 inches in diameter, and two 84 inches in diameter, with a fall of water equal to 26 feet, yielding 1,500 horse-power.

The average sale of the manufactured goods of the company for a few years past exceeded \$7,500,000, or 37,500,000 francs. About 3,600 work-people are now employed by the company. Of these there are 1,680 men, 1,510 women, 80 boys between 10 and 12 years, 140 boys from 12 to 18 years, 40 girls from 10 to 12 years, and 150 girls from 12 to 18 years.

In the origin of the establishment the principle was adopted by the managers that there was to be a mutual dependence between employers and employed, each having rights which the other should respect, and that, inasmuch as the success of the proprietors must depend much upon the cheerful and intelligent co-operation of the work-people, certain plans were adopted to secure "the material, moral, and intellectual welfare of the workmen," both as a duty to them and one of self-interest to the proprietors.

MATERIAL WELFARE OF WORKMEN.

For the material well-being of the laborers, special care was used in the original construction of the workrooms to make them cheerful, comfortable, and well ventilated, so as to avoid, as far as possible, the unpleasant drudgery of work, and to secure order and neatness throughout. Houses were constructed for dwellings which should give to families residences at moderate cost of rent, that would secure the health and comfort of the work-people, while they were cheerful and attractive. Men pay for these houses a weekly rent about equal to one-eighth of their wages. Large buildings were erected for the use of single females whose residences were at a distance, and divided into 17 large apartments, capable of accommodating 825 persons in the aggregate. The rooms are arranged for two persons each, well ventilated and lighted, and comfortably furnished. Unmarried men are never allowed to lodge in these houses, nor in any case a married man, except he is accompanied by his wife, and then but rarely. Females pay about one-third of their average wages for rooms in these boarding-houses, including food, lights, and washing. Fuel for fires in their rooms is an extra expense. It is common to provide coal, and sometimes flour, to the work-people at the cost price of large quantities.

Another effort for the material welfare of the operatives was adopted in the earliest history of the enterprise, and has been continued for nearly 13 years, with marked success, doing much to promote "harmony among all those co-operating," and to establish a bond of sympathy and union.

An association was formed, called "Pacific Mills Relief Society," of which each person employed by the company must be a member, the entire management thereof being in the hands of the work-people, each officer being chosen by themselves from their own number, excepting the president, which office has always been filled by the resident agent or manager, who rarely acts, however, except as counsellor or umpire.

Each person on commencing service elects whether he shall pay two, four, or six cents per week to the relief fund, the lower sum being a little more than $\frac{1}{100}$ th part of the weekly average wages of those who are the youngest, and consequently least paid, and the highest sum, six cents weekly, bearing the same proportion to the average weekly wages of the entire body of work-people. When the sum in the hands of the treasurer of the society, who is always the confidential clerk of the company, and keeps the deposit with the company for protection, has reached the sum of \$1,000, the weekly subscription of all persons who have been employed by the company three months ceases, while it continues with the new comers.

This condition of funds occurs so often that for nearly one-half of the time the older employés are not assessed, and the real sum withdrawn from their wages annually is a very small proportion of their wages, and is far from being a burden to the poorest.

When a person has been in the employ of the company three months, and, consequently, for that time paid his elected sum to the funds of the relief society, he becomes a full member of that society, and entitled to certain privileges. If sickness occurs, preventing him from labor, and he sends notice to the overseer, or head workman of his room, one of the appointed stewards is sent to learn the nature of the illness, and the sick one becomes the special charge of this steward, who, for a man, is one of his own sex, or, if a female, a woman, and it is this steward's duty to see that a nurse and physician are secured, if necessary, and to draw from the wardrobe of the society such changes of personal and bed linen as the circumstances demand.

Each sick person, if the illness continues one week, is thenceforward granted an allowance from the funds of the society. He who has paid two cents per week for at least three months receives \$1 25 weekly for the period of 26 weeks, if sick so long. Double this sum is allowed if four cents have been paid, and \$3 75 when the amount paid has been six cents weekly. In cases of special need the officers of the society are authorized to make an extra allowance, though great care is used in such a dispensation. Those who die poor have their funeral expenses paid, and are respectably buried in the beautiful lot in the city cemetery belonging to the society. In some cases the deceased has been sent to his native town by the desire of his friends, without cost to them, if they were poor.

Sick members are often accompanied to their friends by a steward, or the overseer of their work-room, when too feeble to go alone, or the friends too poor to come for them. The blessings of this society are thus made known to parties at a distance, and it often induced persons of excellent character to seek employment of this company, while those who have secured the benefits of the relief society retain it in warm remembrance. More than one poor mother, whose only child, while a member of this society, has been disabled by sickness, has found the weekly allowance an invaluable aid to her slight income, and called loudly for blessings upon its officers and the institution with such a work of merciful kindness. Many a father and mother, or other relative, whose child or friend has been sent to this company, have besought the blessings of Heaven upon the members of this society, who have cared for their absent ones in the time of sickness, and soothed them as they have faded away from life.

Though there is not space for details of great interest, it must be seen that this plan has a direct tendency to promote sympathy for each other among the work-people, and to secure a bond of union. Most surely those who daily observe its workings see it.

It will also be noticed that a very important feature of this plan is that it is an association of the work-people themselves, wholly controlled by them, and consequently sure of permanency while favored to its present extent by the employers. This is likely to continue, because they witness its important influence and usefulness.

The total amount of money expended for the benefit of sick members in 12 years of its existence, ending in April, 1866, has been \$25,530 68, or 127,653 francs, to 1,868 persons, and the amount paid to the fund in the same time has exceeded this sum about \$1,200. The corporation contributes weekly to this fund, and also to meet individual cases which are specially aggravated.

MORAL WELFARE OF WORKMEN.

To meet the protection of the large number of single females employed by the company, who, as is often the fact in the manufacturing establishments of the United States, and perhaps elsewhere, are away from the guardianship of their friends, the boarding-houses referred to above are controlled by persons carefully selected for their ability to influence this class of work-people, and for their established good character, who will take an interest to secure the comfort of their boarders, and save them from bad moral influences, acting really, as far as possible, in the place of guardians. If a young female is known to visit places of evening amusement of doubtful character, or gives any reason for suspicion that she is guilty of immorality, or even of careless, unguarded conduct, she is admonished, and if reform is not immediate she is discharged from the house and from employment. The doors of the house are locked at 10 o'clock at night, and no one allowed to be out after that hour without a satisfactory excuse. Doubtless persons of immoral character secure employment by the company, and by superior secrecy retain this connection. Among so large a number some will be impure, but it is believed that very few of these females are led astray while connected with the mill, if virtuous when commencing work. It is impossible for an openly vile person to retain connection with the company.

Men of intemperate habits, or of general bad character, are excluded from the company's service, though patience with them is encouraged, with the hope of securing reform; and this forbearance, and attendant labor, has often been rewarded. It is an established principle that all profanity or other bad language, and any bad example or severe use of authority among the head workmen, must be strictly avoided, especially when these overseers have in their charge females or young persons. More than one such responsible workman has been removed for using improper words or ill-treating his subordinates. It is absolutely demanded of these persons that they treat those under them as they would desire to be treated themselves if in their position.

The directors have placed their associate, the manager, at the works to represent their feelings to the work-people; to show them sympathy in their trials, to counsel them in their need of advice, and to be their friend.

Careful efforts have been made by him to secure their confidence, and he has cultivated the conviction that they could ever find in him a father,

brother, or friend. Many hearts have been moved to earnest gratitude for the aid which they have thus secured in their time of need. It requires a vast amount of patient listening to complaints, to tales of sorrow and want; but it has had its reward in seeing so many relieved, made glad and hopeful.

The real moral effect, and the real satisfaction in such a relation between employer and employed, cannot be written. The spirit of the employer is imparted to the more responsible and influential workmen, and to those under them, while a healthy moral condition is secured.

INTELLECTUAL WELFARE OF WORKMEN.

When the company was first established the directors appropriated \$1,000, or 5,000 francs, for the purchase of suitable books for a circulating library, and provided a suitable room for it on their premises. The work-people have always been required to pay one cent each week during their service, and they thus become members of the "Pacific Mills Library Association," which is managed entirely by themselves, they choosing their own officers for the control of its affairs and for the selection of books, but selecting the resident manager for the president and chairman of the library committee. This weekly payment secures the privilege of the use of the library and reading-rooms of the society. One room is appropriated to males, and is supplied with the local newspapers of the city, and of Boston and New York, together with numerous serials of a scientific and literary character, and is open from 6 o'clock a. m. till 9 o'clock p. m., warmed and lighted. It is in close proximity to the other room containing the library, now exceeding 4,000 volumes, and also a cheerful, airy, comfortable apartment for the females, which is carpeted, and made attractive by daily and weekly publications especially adapted to their wants, and stereoscopes with numerous slides, all in charge of an intelligent and cultivated young lady. It is open from 9 o'clock a. m. till 9 o'clock p. m., and is much frequented and valued.

A large number of volumes of the library are in constant circulation, as the number of the work-people who cannot read or write does not exceed 50 in 1,000, and these are universally of foreign birth. All new publications adapted to this class of readers are bought as soon as published. The privilege of taking books from the library is extended to members of families whose head is a member of the association. The funds of the society are also used to purchase tickets of admission to lectures and suitable popular amusements, which are distributed among the members.

This association, as well as the relief society, it will be seen, is supported and managed by the work-people themselves, who secure a valuable return for their small outlay, and also the permanency of its operation, avoiding the dependence for existence and usefulness upon the life, or even connection, of any one person of special prominence.

A law of the State forbids the employment of children under 10 years, and requires that children employed between 10 and 12 years of age shall be in school 16 weeks in each year, and those between 12 and 16 years 11 weeks. The company contributes annually to the support of an evening school for both sexes.

SUCCESS OF THIS CO-OPERATIVE ORGANIZATION.

It has often been stated that care of employers for the elevation and welfare of their operatives, especially to the extent herein shown, is incompatible with pecuniary success. Facts prove that this is not true with the Pacific mills, but others must determine how much of this is due to the principles of action established and maintained.

It is also believed that the work-people have received great benefit.

Some of the evidences of this are the following:

1. There have been no strikes among the work-people, which are their curse, and the dread of employers. They have been encouraged to feel that any grievances will be patiently listened to, and frankly discussed, and the result has always been favorable to good order.

By no means has every uneasy spirit been quieted, but the mass has been satisfied.

2. A higher class of workmen has been secured. Those best able to appreciate the privileges enjoyed in connection with this company have been drawn thither for employment. Specially is this true among the overseers, who engage the laborers in their different departments, and give character to the mass. Their intelligence and hearty co-operation in the plans for the material, moral, and intellectual advancement of the operatives, moulds the whole, and secures a higher standard. The general influence of the principles adopted by the company leads these prominent workmen to feel that they are intrusted with a degree of guardianship of those under them, and this feeling is very manifest. Respect for the manhood of a workman moulds him.

3. Many of the work-people have invested their funds in savings banks, and this is specially encouraged. Formerly the company received deposits themselves from the work-people, allowing an annual interest of six per cent.; but for some prudential reasons this plan was abandoned, and the depositors encouraged to invest in chartered banks. The company held in their hands at one time more than \$100,000, or 500,000 francs, of the earnings of their work-people, which has been changed into other channels. There is no doubt that their deposits now exceed this sum largely.

4. Quite a number of the work-people own houses free of debt, while others have been partially assisted by the company, it reserving a portion of their wages each month in reduction of the debt. More than \$50,000, or 250,000 francs, are thus invested.

5. Others invest their funds in the bonds of the United States government in preference to savings banks.

6. Several of the workmen are owners of the stock of the company, and

have the same rights in regard to the control of the officers and general management as other stockholders. Their stock has now a market value exceeding \$60,000.

7. Investment of earnings in premiums on life insurance has been made by many of the workmen.

8. More than one of the workmen has been a member of the city government in its board of aldermen and common council, and not an annual election passed without the choice of one, or more, to some of these important offices.

9. The pecuniary success of the company has warranted a liberal spirit in the payment of wages to the work-people. The least sum now paid in weekly wages to the youngest employé is \$1 82, gold, a little more than 9 francs, and the number belonging to this class is very small. Boys of 16 years do not receive less than \$2 85, gold, weekly, or more than 14 francs.

The least amount paid weekly to men is \$6 75, gold, or nearly 34 francs, while a very large majority receive much more. Females receive from \$2 48, gold, weekly, or about 12.50 francs for the least, to \$6 72, gold, or more than 33 francs; while a few earn more. This excepts young girls, whose wages are the same as the least sum named above. Spinners, weavers, and a few others are paid in accordance with their product, some of them earning very large wages.

The stockholders, as previously stated, have invested \$2,500,000 in the company. During the past 12 years they have received in dividends more than \$3,000,000, and the fixed property has cost a much larger sum than the amount of the capital stock. The treasurer furthermore holds in his possession a very large amount of undivided earnings with which to purchase cotton, wool, and other materials, for cash.

APPENDIX F.

THE WOOLLEN AND WORSTED TRADE OF GREAT BRITAIN.

Description and statistics from the third report of the commissioners appointed to inquire into the best means of preventing the pollution of rivers, (rivers Aire and Calder,) presented to both houses of Parliament by command of her Majesty, 1867.

A glance at table D of the interesting and valuable returns (page 134) will inform the reader that woollen and worsted products to the extent of 384,200,000 pounds in weight, and of a value of £64,400,000 sterling, are annually sent out of the mills of Great Britain.

The West Riding of Yorkshire is not the only district in which this vast industry is located, but it may safely be taken that from one-half to two-thirds of the woollen and worsted trade is carried on there.

This trade is of ancient date in England. The Romans had weaving establishments of woollen cloth at Winchester, where the copious springs from chalk afforded means both for power and for washing and dyeing. The mother of Alfred the Great is recorded to have been skilled in spinning wool. Flemish woollen weavers settled in England about the time of the Norman conquest, and continued immigration of woollen weavers from Flanders took place in the reigns of Henry I, Henry III, Edward I, and Edward III. The woollen tissues first spun and woven at Worsted in Norfolk, about the year 1388, became the staple trade of Norwich. Devonshire manufactured woollens soon after the introduction of the trade into England, and Worcestershire a little later. Friezes were also early manufactured in Wales. In the middle of the sixteenth century Berkshire took the lead in woollen manufacture.

About the middle of the last century the West Riding of Yorkshire became the seat of the worsted and woollen trades. Halifax began to be specially noted for kerseys. From about this date these trades finding so much water available, not only for power, but also for washing, dyeing, scouring, fulling, and all other purposes, the Yorkshire manufacturers and traders were enabled to undersell those of other places.

The rivers Aire and Calder were made navigable by act of Parliament about the year 1698, and have from time to time been improved so as to meet and supply the requirements of a growing trade. This navigation has such advantages and has been so ably managed up to this date that it successfully competes with the established railways.

It is of the utmost importance to study the rise, progress and condition of any manufacture, especially if it has changed its locality. Successful trade is generally contingent upon local natural advantages which forethought and care may improve, or which continued abuse may deteriorate and even ultimately destroy. The West Riding of York-

shire, and especially the Aire and Calder district, possesses many natural advantages favorable to the establishment and conduct of trades requiring good water. A range of mountains composed principally of scar, limestone, and Yoredale rocks, capped with millstone grit, forms the western boundary, and sends down numerous spring-fed rivulets and streams to wind and flow over the entire breadth of this portion of the county. The graduated fall affords means of obtaining water power, and the numerous valleys offer favorable sites for storage reservoirs. The vast numbers of mills and dyeworks (upwards of 5,000) established since the commencement of the present century, and the rapid growth of the worsted and woollen trades of the West Riding, clearly indicate that the natural advantages of this part of Yorkshire are great. There are not only spring and river water, but there is also cheap fuel obtained from the local coal field, enabling the manufacturers to supplement water power with steam, and in numerous instances to obtain all the power required from steam alone. Abuses in the district by throwing solids into running waters and by pollution have, however, become in some cases destructive to trade, and in numerous cases prohibitive to further extensions, some branches of trade having migrated to Scotland, where water less polluted is obtainable.

The various processes to which water is put in cleansing wool and in manufacturing woollens and worsteds, may be stated as follows:

1. Scouring the wool with a ley and hot water to remove grease and dirt.
2. Washing with clean cold water.
3. Dyeing when the cloth is to be wool-dyed.
4. Scouring cloth with fuller's earth to remove oil and size.
5. Dyeing when piece-dyed.
6. Milling or fulling with soap and warm water, either in the fulling stocks or in the improved milling machines, where the cloth is squeezed between rollers.
7. Scouring to remove the soap.
8. Boiling cloth to give it a permanent face.
9. Steaming to take away the liability of the finished cloth to spot.

Dirty water may be used for power, but even for such purpose it is a nuisance, and for washing and dyeing water may be so polluted as to be injurious even to dark and coarse goods, and totally unfitted for cleansing and dyeing fine fabrics.

The vast interests involved in the wool, woollen, and worsted trades of Great Britain are set forth in the following statistical tables kindly furnished to the commission by Mr. Jacob Behrens, vice-president of the Chamber of Commerce of Bradford.

TABLE A.—*Estimate of the produce of wool in the United Kingdom from 25,795,708 sheep, based upon a return made for Great Britain on the 5th of March, 1866, and for Ireland in 1865.*

	Number of sheep.		Weight per fleece.	Wool produced.
	Under one year old.	One year old and above.		
			<i>Pounds.</i>	<i>Pounds.</i>
In England	4, 505, 345	10, 620, 196	6½	69, 031, 274
In Wales	380, 854	1, 287, 809	5½	7, 082, 250
In Scotland	1, 624, 638	3, 630, 439	6½	23, 597, 853
In Ireland	1, 048, 491	2, 640, 251	6	15, 841, 506
Isle of Man and Channel islands.....	24, 410	33, 196	6½	215, 774
Total.....	7, 583, 817	18, 211, 891		
Under one year old hoggets.....	5, 583, 817	.....	6	33, 503, 293
Lambs killed and clipped.....	1, 000, 000	.....	3	3, 000, 000
Lambs killed and not clipped	1, 000, 000	.....		
Total.....				152, 272, 650

MEM.—The number of sheep in Ireland under one year old is supposed to bear the same proportion to the whole number as that given in the return for Great Britain.

TABLE B.—*Estimate of the quantity and value of wool and similar material worked up in worsted and woollens.*

Articles.	Produce and imports.	Exports.	Retained for home consumption.	Price per pound.	Value.
				£ s. d.	
English wool	152, 272, 650	7, 320, 299	144, 952, 351	0 2 4½	£17, 213, 075
Foreign wool	206, 473, 045	55, 993, 803	150, 539, 242	0 1 6½	11, 123, 905
Goats' hair or wool.....	4, 737, 330	.....	4, 737, 330	0 2 8½	650, 191
Home-made shoddy	52, 000, 000	.....	52, 000, 000	0 0 5	1, 083, 334
Imported shoddy.....	22, 482, 880	.....	22, 482, 880	0 0 4¾	494, 611
Wool extracts	5, 000, 000	.....	5, 000, 000	0 0 6	125, 000
Foreign yarn	4, 479, 984	.....	4, 479, 984	0 4 6	1, 008, 004
Total.....	447, 445, 889	63, 254, 102	384, 191, 787	.....	31, 698, 120

MEM.—Imports, exports, and values from Board of Trade tables for 1864, except quantity of English wool, for which see A.

TABLE C.—*The exports of wools, tissues, and yarns, and the quantity of foreign wool worked up in the years 1844, 1854, and 1864.*

Description.	1844.	1854.	1864.
Exports of English wools.....	£535, 134	£734, 490	£673, 446
Exports of worsted yarns.....	958, 217	1, 557, 459	5, 417, 377
Exports of wool tissues	8, 204, 836	9, 121, 186	18, 533, 457
Exports of British produce.....	50, 642, 306	97, 092, 308	160, 449, 053
Foreign wool retained for home consumption.....lbs..	63, 741, 087	81, 654, 711	155, 276, 572

Comparative percentage of the exports of worsted and woollen manufactures to the other textile fabrics in 1864.

Description.	Value.	Per cent.
Exports of worsteds	£16,217,898	*17½
Exports of woollens	7,732,976	*8½
Exports of cottons	54,882,329	59
Exports of linen and jute	11,636,049	12½
Exports of silks	2,274,927	2½
Total.....	£92,744,179	100
Total exports of British produce	£160,449,053	.....

* Six per cent.

TABLE D.—*Estimate of the value and weight of wool and similar material manufactured into worsted and woollen yarns and tissues in the United Kingdom, 1864.*

Description.	Pounds.	Value.
English wool, exported as yarns	35,000,000	£5,500,000
English wool, manufactured into tissues, 4s.....	110,000,000	22,000,000
Foreign wool, manufactured into tissues, 3s.....	150,500,000	22,600,000
Mohair wool, manufactured into tissues, 5s.....	4,700,000	1,200,000
Foreign yarn, manufactured into tissues, 8s.....	4,500,000	1,800,000
Shoddy and extracts, manufactured into tissues, 1s.....	79,500,000	4,000,000
Cotton, yarn, and other material.....	.....	7,300,000
Total.....	384,200,000	£64,400,000

TABLE E.—*Estimate of the value and weight in 1864 of the wool and similar material worked up with it into worsted and woollens for export and home consumption.*¹

WORSTEDS.

Description.	Pounds.	Value.
EXPORTS.		
Yarns, (31,824,296 pounds,) equal in wool to.....	35,000,000	£5,417,377
Goods, one-fourth mixed with other materials, £6,000,000, wool, 4s.....	30,000,000	7,945,633
Goods, all wool, 4s.....	14,000,000	2,852,815
HOME.		
Goods, mostly mixed with other material, 4s.....	66,000,000	13,200,000
Goods of mohair, mostly mixed with other material, 5s.....	4,700,000	1,200,000
Cotton and other material worked up with the above, exclusive of exports.....	.....	2,984,175
Total.....	149,700,000	£33,600,000

¹ In this estimate all English wool is considered as worked up into worsted, and that which is worked up into woollens is supposed to be more than balanced by the foreign wool (Russian, Australian, and others) in worsteds.

TABLE E—Continued.

WOOLLENS.

Description.	Pounds.	Value.
EXPORTS.		
Goods, mixed with one-fourth of other material, £890,000, 1s.....	18,000,000	£1,186,815
Goods, all wool, (foreign,) 3s.....	43,500,000	6,546,161
HOME.		
Goods of foreign wool, 3s.....	107,000,000	16,000,000
Goods of foreign yarns, 8s.....	4,500,000	1,800,000
Goods, shoddy and extract, 1s.....	61,500,000	3,200,000
Cotton and other material mixed with wool.....		2,067,024
Total.....	234,500,300	30,800,000

Under the name of shoddy, which occurs so conspicuously in the foregoing tables, an enormous weight of material is used which, until recently, was waste. Shoddy was first introduced into use about the year 1813, at Batley, near Dewesbury. Mungo was adopted in the same district, but at a later period. Shoddy is the produce of soft woollen rags, such as old worn-out carpets, flannels, Guernseys, stockings, and similar fabrics. Mungo is the produce of worn-out broad or similar cloths of fine quality, as also of the shreds and clippings of cloth. It was stated at our inquiry that the term arose in consequence of the difficulty at first of manipulation. A manufacturer gave some of the materials to his foreman, who, after trial in the shoddy machines, came back with the remark, "It winna go;" when the master exclaimed, "But it mun go!" These woollen rags are collected, packed in bales, and are imported from Russia, Egypt, Turkey, the entire area of Europe, India, China, and, in fact, from all parts of the world where woollen garments are worn, and rags produced and can be collected. They come to Yorkshire from districts where plague, fever, small-pox, and loathsome skin diseases extensively prevail. The bales are opened and the rags are sorted by human fingers before being placed in machines, which break up, tear, separate, and cleanse the fibre for manufacturing uses. According to the evidence we obtained no disease has ever broken out among the persons who so manipulate these old woollen rags, although in many of the countries in which they are collected they are believed to be peculiarly plague-bearing materials. The lapse of time in collecting, storing, and transmitting these rags, as also the possible destruction of any special poisons, by friction or otherwise, must be taken into account. The whole of the facts deserve, however, the serious attention of those persons who insist that the power of communicating disease is contained in a dangerous manner by woollen goods which have been worn by persons suffering from contagious diseases. The experience obtained by

the manipulation of shoddy, for upwards of 50 years, proves that old woollen rags are not in any degree dangerous to the health of those who work among them.

The shoddy trade, as now carried on in the West Riding, is a remarkable instance of the utilization of waste material. The term "shoddy" was, in the first instance, one of reproach, but this has ceased to be. Shoddy now enters into honorable companionship in official returns with British and foreign wools, mohair, silk, and cotton, and is used by manufacturers throughout the woollen and worsted districts. By recent returns (1866) the total weight of wool and goats' hair—of home and foreign growth—used, was about three hundred and ten millions of pounds; the total weight of shoddy and extracts for the same period was about seventy-four and one-half millions of pounds, or some thirty-three and three-quarter thousand tons; so that shoddy now forms near one-fifth, by weight, of the woollen and worsted manufacture of the district. The woollen trade of Great Britain could not be carried on to its present extent without shoddy.

Shoddy is mixed with wool in proportions from one-third to two-thirds shoddy or mungo, and is used in the manufacture of cheap broadcloths, fine cloths for ladies' capes and mantles, pilots, witneys, flushings, friezes, petershams, duffels, houleys, paddings, linings, cloths used for rough and loose great-coats, office-coats, and trousers, pea-jackets, and blankets. A considerable quantity is used in the form of flocks for beds. Felted cloth is extensively manufactured; it dispenses with spinning and weaving, depending on the felting property of wool by reason of the curl in the fibre. The process is carried on by the aid of warm moisture, pressure, and milling; such cloth is used for table-covers, horse-cloths, carpets, paddings, druggets, and the coarser and thicker kinds for covering steam boilers, steam pipes, and ships' bottoms beneath the copper. Some of the finer and better class of felted cloths are printed.

The manufacture of shoddy and mungo need not produce any special pollution. The rags are torn into fibre by machines specially prepared, and the dirt, dust, and fine particles of wool are blown out in such manner that this refuse can be collected and sold for manure. About one-seventh, by weight, of shoddy is so cleaned out as waste in preparing it. The price obtained for it as manure varies from 10s. to 20s. per ton. Some of the richer sort of waste shoddy is sent into Kent as a dressing for hop-growing.

INDEX.

A.

	Page
Africa, annual production of wool in	18
Agassiz, Professor, views on the effects of the crosses of races of men	91
opinion of, in regard to the whiteness of animals	97
Aix la-Chapelle, production of	61
American goods, qualities of	21
manufacturers, duties of	66
American merino sheep, table of measurements of	72
difference in from Spanish merino	73
Paular family of	73
Infantado family of	73
washed wool of	78
scoured fleeces of	78
quality of wool of	79
improvement in	74
price of rams	75
ram "Twenty-one per cent.," note	75
increase of yolk in	76
Ancyra, description of by Tournefort	94
Angora, description of its goats by Tournefort	95
number of goats in district of	99
Angora goat, impracticability of crossing with common goat	105
importance of acclimatizing the breed in this country	105
effect of crossing black female with white-buck	98
variety of shawl-wool goat	99
power to resist extreme cold, but not moisture	97
results of acclimation in Europe and America	99, 100
differences between this and common goat	88
Aniline colors, discovery of by Runge	43
Perkins violet	43
affinity of for materials of animal origin, or nitrogenized substances	44
stability of	44
Annual French card wool production	34
Annual production of wool in France	18
Great Britain	18
Spain, Italy, and Portugal	18
Germany	18
European Russia	18
Australia, South America, and South Africa	18
United States	18
British North American provinces	18
Asia	18
Northern Africa	18
Antiquity of the woollen trade in England	131
Appian, mention of stuffs known as <i>κιλικια</i> by	87
Appleton, Mr. Nathan, "History of the introduction of the power loom and the origin of Lowell," by	27

	Page.
Archil or <i>orseille</i> , a new kind introduced by MM. Guinon Marnas and Bonnet.....	42
Asia, annual production of wool in.....	18
Atwood, Stephen, Spanish merinos of.....	69, 70
Australia, total production of wool in.....	111
annual production of wool in.....	18
Austria, value and amount of production of.....	61
fabrics of	19

B.

Bachman, Dr. John, reference to paper on Angora goat by.....	89
Baird, Professor, opinion of affinity of Rocky mountain goat with antelope.....	84
Bauendahl & Co., letter of to Mr. G. W. Bond in regard to mohair or goat's wool..	104
in <i>Country Gentleman</i> in regard to mohair—note.....	105
Behrens, Mr. Jacob, statistical tables of.....	133
Belgium, woollen industry of	60
fabrics of	19
Belon, Father, mention of Angora goat first by	87
Benoville, M., treatise on woollen industry of France	44
Bernstein, Michel, flock of.....	16
Berthollet, M., work on dyeing by	39
Bigelow, Mr. E. B., remarks of.....	30
Billancourt, exhibition at.....	11
Bowes Mr., statement in regard to Scotch cassimeres	15
statement in regard to American merinos.....	10
Bradford, manufactures of.....	63
Brandt, M., description of the Angora goat by	82
dimensions of specimen examined by.....	83
argument of in support of his assertion in regard to the derivation of the domestic goat.....	85
observations in regard to spinning Angora goat's hair	85
British North American provinces, annual production of wool in	18
Buenos Ayres, wools of.....	8

C.

Calico printing, foundation of.....	39
Cape wools	8
Capra, division of the genus by Cuvier.....	83
division of the genus by recent zoologists	84
Card-wool fabrics of various countries.....	20
Carpets, American.....	22
Brussels and tapestry.....	22
Cashmere goat, note.....	84
Cateau, immense establishment.....	55
perfection of machinery and processes	56
wages and condition of the workmen	56
manufacture of imitation Cashmere shawls..	57
Centres of woollen industry in France, treatises by M. Randonig and M. Benoville..	44
Chapin, Mr., paper of, in regard to Pacific Mills	25
Chemical Society in London, publications by.....	39
Chenery, Mr. Winthop W., flock of Angora goats of, note	101, 102
Cheviot sheep, character of.....	15
character of wool of.....	14
Chevreur, M., lectures of, to the artisans of Lyons	38
Cloakings, Austrian	24

	Page.
Clothing wools, ability to grow fine, in the United States.....	9
Australian	8
Silesian and Saxon	8
production of, in the United States in 1866	9
Colbert, regulations for dyeing wools.	38
Columella, no mention of Angora goat by.....	87
Combing wools, growth of, in the United States	13
price of English fleeces in 1855 and 1864.....	13
profit of growing, in United States	14
French and Australian.....	10
present consumption of, in United States	13
English	13
necessity of growth of, in United States	113
extraordinary care taken in growth of, in England.....	112
amount of, produced in Canada.....	113
Combing-wool sheep, profit in keeping. Table by Mr. Winnie.....	120
Comparative rates of interest in France, England, and United States, table of.....	30
Competition between different countries in the growth of merino wool	119
Consumption of wool in England at present time	110
Crompton loom, the.....	20

D.

Dana, Dr., of Lowell, honorable mention of, by French savans	44
Davis, Dr. J. B., importation of Angora goats by, in 1849.....	101
De Kaeppilin, M., treatise on dyeing	39
Des Farges, M., on the peculiarities of the French merino.....	12
Designers of Elbeuf, peculiar character of their work	46
Diehl, Mr., contribution on the Angora goat	90
observations by, on flocks of Angora goats in the southwestern States..	101
Domestic woollen industry identified with agricultural prosperity.....	32
Dyeing, discoveries by Vauquelin.....	39
discoveries by Lassarque.....	39
new process introduced by Loffet	39
colors fixed by steam	40
discovery by Mr. Steiner.....	40
discovery of cheap process of manufacturing ultramarine by Guimet	40
the use of madder and colors derived from it.....	40
advantages resulting from the recent improvements in madder.....	41
in France, and the contributions of modern science to the art.....	38
Dyes in American carpets.....	22

E.

<i>Echantilleurs</i> , character of their work.....	46
Elbeuf, separate establishments of.....	47
statistics of Chamber of Commerce of.....	47
prices of food in.....	48
low tone of morality of workmen of.....	48
centre of card-wool industry of France	45
population and value of production of.....	45
facilities for credit in.....	46
Elder, Dr., statement of in regard to exportation of wool	32
England, number of sheep per acre	6
importation of wool in 1830	7
importation of wool in 1864	7
annual production of wool in.....	13
exportation of wool at present time	110

	Page.
English operatives, inferiority of technical education of	64
Exposition, fabrics of	18
F.	
Factory, system of New England	28
Fibre, character of wool	18
Fine wools, need of them in United States	115
"Fitting sheep," fraudulent practice	77
Flannels, opera	22
"Fleece and Loom," extract from	34
Fleischman, Mr., on the results of constantly regenerating with the pure-blooded Merino ram	93
France, sheep husbandry in	11
superiority of her manufactures of wool	32
exportation of woollen goods in 1855 and in 1865	33
principal centers of production of woollen fabrics	33
products of, in class 29	33
products of, in class 30	33
exportation of card fabrics in 1865	34
annual production of wool in	18
exportation of woollen goods in 1861 and in 1863	110
French Merinoes, character of	11
Merinoes, change effected in	12
taste, excellence of	36
Full-blooded American Merino sheep	67
G.	
Gayot, M., notice by on Merino ovine races exhibited at Billancourt	11
Germania mills, goods of	23
exhibition by	24
Germany, the woollen manufacture of the Zollverein	61
annual production of wool in	18
Great Britain, woollen manufacture in	62
annual production of wool in	18
Grove, Henry, importation of Saxon Merino sheep by	69
Groups of French woollen industry	34
H.	
Halifax, manufactures of	63
Henry VIII, act in regard to city of York	63
Huddersfield, manufactures of	63
Humphries, Colonel, Merino sheep of	67
Huskisson, Mr., on woollen manufactures of Great Britain	62
I.	
Importance to American farmer of the production of combing wool sheep	121
Importations of wool into Great Britain in 1830, 1862, and 1864	110
Industrial society of Mulhouse, publications by	39
Influence of Anglo-French treaty on French artists	65
J.	
Jardin des Plantes, model and source of societies of natural history	81
Jarvis, Mr. William, Merino sheep imported by	68

K.

	Page.
Kilogram, equivalent of	16
Knit goods, manufacture of	23
Knitting machines	23

L.

Labor, prices of here and abroad	31
La Plata, fine wool of	111
Leeds, manufactures of	63
Leicester sheep, price of in England and United States	121
Lo-kao, Chinese green, introduction of	42

M.

Machinery, American	29
Mazamet, workshop nurseries of	52
Merino combing wools	10
Negretti, race of	13
Mission mills, San Francisco, exhibition of goods of	24
Mohair, use of in the manufacture of Utrecht velvets	103
use of in manufacture of shawls	103
use of in manufacture of lastings, cloakings, dress goods, &c.	103
annual export of from Turkey	104
price of per pound	104
application of in the manufacture of fabrics	102
Mousselines delaine, manufacture of	25
Mungo, origin of the word	112
introduction and use of	135

N.

National association of wool manufacturers, extract from report of	22
report of	79
Negrettis sheep, weight of fleece of	70
Number of animals domesticated by man	81

P.

Pacific mills, success of co-operative organization	130
wages of work people in	130
medal awarded to	25
Patent Office Agricultural Report, paper on Angora goat, by Dr. John Bachman	89
Pood, equivalent of	16
Portugal, annual production of wool in	18
"Practical Shepherd," principles of breeding discussed in	92
Price of Leicester or Cotswold sheep in England and United States	121
Production of wool in England at present time	110
Profit in keeping combing wool sheep, table by Mr. Winnie	120
Prussia, fabrics of	19

Q.

Quatrafages, M. de, discussion by on the formation of races	91
---	----

R.

Rambouillet, flock of Angora goats at	100
Randall, Dr., observations on the principles of breeding	92
Randonig, M., treatise by on woollen industry of France	44
Relative cost of production of American and foreign fabrics	28, 29
Region du Midi, centre of card wool industry of France	50
towns which it comprises	51

	Page.
Region du Midi, production of peculiar fabrics for the Levant, for the army.....	51
workshop nurseries of.....	52
peculiar customs at Villeneuveville	52
wages of workmen in.....	53
Rhims, centre of combing wool industry of France.....	53
production of merino fabrics	53
improvements in combing wool.....	53
power loom applied to manufacture of merino fabrics.....	54
the United States the outlet for its goods	55
importance of manufacturing merino fabrics in United States.....	55
wages and condition of workmen of	55
Rivers Aire and Calder, pollution of water of.....	131
Roubaix, the rival of Bradford.....	57
history of its growth.....	57
public sentiment of opposed to Anglo-French treaty.....	58
excellent character of its fabrics	58
fabrics of for women and children.....	59
amount of wool consumed in 1843; amount of goods produced.....	59
wages of workmen in.....	59
Russia, fabrics of	20
European, annual production of wool in.....	18
vast scale of sheep husbandry in.....	16

S.

Sacc, M., opinion of on crossing Angora with common goat	89
Saxon merino sheep, introduction of	69
Saxony wool, importance of the growth of in this country.....	108, 109
Sedan, manufactures in.....	49
superiority of the moral tone of its workmen.....	49
wages of workmen in.....	50
Shawls, excellence of American.....	79
Shoddy, manufacture of.....	19
amount of manufactured	112
introduction and use of.....	135, 136
Silk-mixed goods, use of.....	23
origin of.....	49
Slater, Mr., goods exhibited by	8
South America, annual production of wool in.....	18
Spain, annual production of wool in	18
Spanish merino sheep, importations of, by John T. Rich, Francis Rotch and Henry D. Grove.....	70
weight of wool of	71
table of measurements of	72
faults and merits of.....	69, 70
St. Hilaire Geoffrey, assent of, to opinions of M. Brandt and M. Sacc	86
Strabo, no mention of Angora goat by	87
Stursberg, Mr. H., medal awarded to	24
Symons, Mr., statement of, in regard to woollen manufacture of the United Kingdom.....	63

T.

Tariff legislation, importance of	31
Tchihatcheff, M., memoir on Angora goat.....	86
Tilebert, M., flock of	16
Tour d'Aignes, M. de la, observations on breeding the Angora goat	93
Tournefort, M., description of the ancient city of Ancyra and the goats of Angora....	94
Turkey, fabrics of	19

U.

	Page.
United States, number of sheep per acre	6
annual production of wool	18
future sheep husbandry	15, 16
Ure, Dr., on the habits of the silk weavers of Lyons	37
Utrecht velvets, manufacture of, in France	103

V.

Value of woollen goods manufactured in the United States in 1864. Table	123
Verviers, production of	60
wages of workmen in	61
Vesey, Mr., facts by, on the production of Aix-la-Chapelle	61
Villeneuve, peculiar customs in	52

W.

Walworth, Mr. Joseph, letter of	118
Washington Mills, medal awarded to	24
Water, use of, in the manufacture of woollen cloth	132
Webster woollen mills, S. Slater & Sons, medal awarded to	24
West of England, fabrics of	19
West Riding of Yorkshire, advantages of, for woollen manufacture	62
manufactures of	62
cost of living and wages in	64
Woollen industry of Europe	32
manufactures in Europe	17
Worsted wools, where grown	119
manufactures of England	118
United States	119
“ Wrinkles on ” Merino sheep, objections to	77

Y.

Yolk, development of	10
increase of, in American Merino	76
Youatt, Mr., observations of, in regard to the breeding of horses	92
Zollverein, wages of workmen in	61

LIBRARY OF CONGRESS



0 018 532 818 1